

## CHAPTER 4

### ENVIRONMENTAL CONSEQUENCES

#### OVERVIEW

This chapter describes the potential effects on the environment of implementing each of the four alternatives described in Chapter 2. These impacts are presented relative to the existing conditions presented in Chapter 3 and quantified to the extent practical with available data. This Draft RMP/EIS provides a broad scale, “big picture” level of analysis, and the exact locations of projected oil and gas development and other changes are not known at this time. Therefore, the analysis in this chapter represents best estimates of impacts, calculated primarily through GIS applications. Impacts to the resources presented in Chapter 3 are described under each alternative and by each issue that would affect that resource. If an issue is not listed, it is because no impacts to that resource are anticipated.

The primary impacts in the planning area would be due to projected increases in oil and gas activities and would result mainly from surface disturbance. The evaluation of these impacts is based on the number of wells and associated infrastructure projected over the next twenty years in the RFDS (Engler et al. 2001), modified by changes in boundaries and management of specially designated areas. The impacts would occur mainly in the high development area in the San Juan Basin. New or incompletely developed areas with low potential for mineral resource production lack the geologic data to predict well numbers and to enable more than a qualitative discussion of potential impacts.

Within the FFO area, the analysis addresses revisions to the RMP in all management areas, in addition to oil and gas development. The focus is on the five issue areas described in Chapter 1. The analysis pertaining to USFS and USBR land focuses on the evaluation of the impacts from oil and gas development and provides information needed to develop the Conditions of Approval of oil and gas leasing

and development. This Draft RMP/EIS does not address the comprehensive range of land management issues for USFS and USBR land.

Impacts are defined as modifications to the existing environment brought about by implementing an alternative. Impacts can be beneficial or detrimental, result from the action directly or indirectly, and can be long-term, short-term, or temporary.

Direct impacts are attributable to implementation of an alternative that affect a specific resource and generally occur at the same time and place. Indirect impacts can result from one resource affecting another (e.g., soil erosion and sedimentation affecting water quality) or can be later in time or removed in location, but are still reasonably foreseeable. Long-term impacts are those that would substantially remain for many years or for the life of the project. Temporary impacts are short-lived or ephemeral changes to the environment that return to the original condition once the activity is stopped, such as air pollutant emissions caused by earthmoving equipment during construction. Short-term impacts result in changes to the environment that are stabilized or mitigated rapidly and without long-term effects, such as surface disturbance that is revegetated immediately after earthmoving is completed. Impacts can vary from a slightly discernible change to a full modification or elimination of the environmental condition.

Cumulative impacts are also addressed for each resource. These are the effects of the proposed action in combination with other known and reasonably foreseeable past, present, and future actions within the San Juan Basin.

#### ASSUMPTIONS AND ANALYSIS

The estimates of long-term disturbance resulting from oil and gas development used for impact analysis are based on assumptions from the FFO and the RFDS developed by NM Tech.

To develop the RFDS, NM Tech used GIS coverages of existing wells, examined historic production data, and analyzed production characteristics for each major reservoir in the New Mexico portion of the San Juan Basin to derive the projected number of total available completions (16,615) in the New Mexico portion of the San Juan Basin and their spatial distribution. Of this number of total completions, there would be a 25 percent reduction in well bores due to dual completions and commingling, 80 percent of which would occur on federal minerals, bringing the projected number to 9,970 over the 20-year period of analysis. This is the predicted number of wells that was used as a starting point for determining the number of new wells on federal land under each alternative. To provide an upper limit for analysis, Alternative B assumes no commingling. As explained in Chapter 2, land use planning decisions and management prescriptions were used to determine the actual number anticipated under each alternative.

The RFDS obtained the predicted number of commingled wells by decreasing the total number of locations where reservoirs could be accessed under the same spacing and densities that are allowed by rule to be commingled. The RFDS provided no basis for predicting the number of wells that could be completed through CBM wells drilled using coiled tubing. Therefore, although use of this technology can affect the amount of surface disturbance, it was not evaluated in this analysis.

Although the exact locations of these new wells are not currently known, the RFDS predicted the number of locations on a township-range basis. The locations were predicted using current and expected spacing units and well densities for producing formations in the San Juan Basin. In addition, the production characteristics, including the extent and amount of remaining reserves for each formation, were analyzed and used to predict the spatial extent of the wells in the San Juan Basin. A detailed explanation of the procedures used to predict the number of wells

and areas of oil and gas development is included in the RFDS (Engler et al. 2001).

Surface disturbance caused by the construction and operation of oil and gas wells was estimated by applying the following assumptions, derived from the RFDS and from estimates based on historic data provided by FFO personnel:

- New surface disturbance would occur on 54 percent of all new well bores, while 46 percent would be located on existing sites through re-completion, dual completion, or directional drilling.
- Initial surface disturbance for new well pad construction would average 3.5 acres, with 1.5 acres reseeded and stabilized after construction is completed, resulting in the long-term surface disturbance associated with each new well pad averaging 2 acres, after interim reclamation takes place.
- When using an existing well pad to locate a new well bore, the size of the altered pad would be approximately 2.5 acres, adding 0.5 acre. It is assumed that no new surface disturbance from road or pipeline installation would occur for co-located wells.
- The road and pipeline disturbance associated with each new well would average 1.5 acres initially when accounting for a wider area of disturbance during construction, and 1 acre long-term. An average of 800 feet of road and pipeline would be constructed within the same 50-foot wide disturbed area. Any net increase in water disposal lines associated with the Fruitland Coalbed Methane activity is assumed to be included in these figures.
- Final abandonment and reclamation would be completed at an initial rate of 133 well pads and associated ROWs per year, averaging 3 acres per well. The plugging and abandonment rate is projected to increase at the rate of 5 percent per year over 20 years. Most

P&As would occur in the fringe areas of the project, with abandoned sites in the high development area likely to be used again.

- There is approximately 168,000 horsepower (HP) of existing compressor stations in the San Juan Basin. An additional 360,000 HP of large compression sites are projected in association with the gas gathering systems necessary to support the projected development. The additional compression sites would be scattered throughout the intense development area and are projected to include 10 to 20 stations ranging in size from 2,000 to 10,000 HP and 200 to 300 stations ranging in size from 500 to 2,000 HP. In addition, as the field continues to mature, wellhead compression is assumed to increase, with half of the planning area wells having compression averaging 100 HP at any given time over the life of the plan. Total compression could approach 2,278,000 HP.

The total amount of surface disturbance was derived considering the following:

- New wells, roads, and small pipelines, both on newly constructed well pads and on existing well pads;
- Large pipelines;
- Compressor installations; and
- Final reclamation of well pads.

To predict the amount of surface disturbance associated with new wells, the analysis determined how many well locations could reasonably be developed in stipulation-restricted areas. Subsurface minerals located under a “no surface occupancy” area can be accessed from a surface location within 1,500 feet of the restricted boundary. This distance is a typical achievable offset for a directional well drilled to the Mesaverde/Dakota formations. The number of wells predicted to be “not accessible” (greater than 1,500 feet from the NSO area) was subtracted from the total

number of predicted wells under each alternative to obtain the remaining number of wells predicted as available for drilling. To determine how much acreage would be disturbed through the construction of new wells on new pads, the number of remaining locations was multiplied by 54 percent and then by the 3-acre average disturbance associated with each location. To determine the amount of surface disturbance associated with wells drilled on existing well pads, the number of remaining locations was multiplied by 46 percent and then by 0.5, which represents the average incremental acreage necessary to add a well to an existing well pad.

The amount of surface disturbance associated with large transmission pipelines was determined by assuming that the number of compressors and amount of pipeline required under each alternative would vary according to the amount of producible hydrocarbons. The amount of produced hydrocarbons is proportional to the number of completions, which in turn is affected by the number of available surface locations. Reserves producible under Alternatives B, C, and D differ only by the number of locations that would not be accessible due to surface constraints. Most of the available hydrocarbon reserves would be accessible under those three alternatives through commingling, dual completions, directional drilling, or other innovative drilling techniques. Thus, the number of possible completions is approximately the same for all three alternatives although the number of new surface locations for each alternative varies according to the surface stipulations. The results reflect the largest amount of surface disturbance possible under each alternative. The amount of surface disturbance associated with larger pipelines and compressors was determined by applying the percent of wells removed after applying surface stipulations under each alternative to the amount of acreage listed in the assumptions (11,716 acres for pipelines).

Compressors in the planning area differ in the amount of surface area required for their installation. Wellhead compressors are typically

installed on the well pad, requiring no additional acreage. They were assumed to create no new surface disturbance. This analysis assumed that the maximum amount of acreage required for installation of Phase 1 compressors (2,000 to 10,000 HP) would be 10 acres each. The RFDS predicted 10 to 20 Phase 1 compressors would be installed during the period of analysis. This analysis also assumed that Phase 2 compressors (sized from 500 to 2,000 HP) require 5 acres each for installation. The RFDS predicted 200 to 300 Phase 2 compressors would be installed during the period of analysis. There may be more than one Phase 1 or Phase 2 compressor at a compressor site or station.

The net amount of surface disturbance associated with each alternative was determined by subtracting the amount of acreage predicted for reclamation under each alternative from the total amount of disturbance predicted for well pad construction, larger pipelines, and compressors. There is, however, already a backlog of well pads waiting for field review and approval of final abandonment by the FFO. These locations cannot be considered "reclaimed" until that approval is granted. This analysis did not consider the backlog or how it may impact net surface disturbance in the future. The amount of reclaimed surface was assumed to be the same for all alternatives and calculated according to the FFO assumptions. Initially, 133 well pads at 3 acres each would be reclaimed during the first year, increasing at a rate of 5 percent per year thereafter. This would result in 13,194 acres of reclaimed land at the end of 20 years.

## **ALTERNATIVE A – CURRENT MANAGEMENT**

### **Surface Disturbance Due to Oil and Gas Development**

There would be 4,421 projected new well bores on federal minerals over a 20-year period in the planning area. Over 20 years, this would average 223 wells per year.

The surface area that would be modified for the long-term for construction of new well pads or additions to existing well pads for new well bores, access roads, and small pipelines would total 8,179 acres. Long-term surface disturbance for large pipelines and 114 Phase I and II compressors would total 5,949 acres (**Table 4-1**). Alternative A would involve approximately 44 percent of the maximum number of potential new wells projected in the RFDS.

After 20 years, 13,194 acres would be reclaimed. Because 46 percent of the new wells are assumed to be located on existing pads, the acreage disturbed for new development would be less than that reclaimed on an equivalent number of wells (Table 4-1). Therefore, the implementation of Alternative A would result in a net long-term surface disturbance of 934 acres, without taking into account the plugged and abandoned well backlog that may be approved for reclamation.

### **Watersheds**

Several of the federal agencies in the planning area manage their resource programs on a watershed basis. Information on surface disturbance by watershed is important to predict short- and long-term impacts on soils, sediment yields, habitat fragmentation, cultural resources, and surface water quality. This section estimates the surface disturbance caused by oil and gas development that is used to analyze impacts on other resources.

The number of wells projected for each watershed in the planning area was calculated using GIS based on the future locations of oil and gas development by township and range in the RFDS. This number was reduced by the number of wells that would not be accessible due to NSO constraints. It was assumed that the initial vegetation clearance and earthmoving would disturb up to 5 acres for well pads and associated infrastructure, representing the term area of surface disturbance that would affect wildlife habitat, soils, and cultural resources. Under Alternative A, there would be 2 wells in specially

designated areas and 6 wells on USBR land under the water surface and the land adjacent

to Navajo Reservoir that would not be accessible.

**Table 4-1. Surface Disturbance Associated with Well Development under Each Alternative**

	Alternative A	Alternative B	Alternative C	Alternative D
Total number of predicted new well bores on federal land over 20 years	4,438	13,292	9,970	9,970
Number of well locations not accessible due to NSO constraints	17	17	134	28
Remaining number of locations available for development	4,421	13,275	9,836	9,942
Long-term surface disturbance associated with new wells (acres)	7,162	21,506	15,934	16,106
Surface disturbance associated with existing well pads (acres)	1,017	3,053	2,262	2,287
Total amount of new surface disturbance associated with wells (acres)	8,179	24,559	18,197	18,393
Amount of surface disturbance associated with construction of large pipelines (acres)	5,195	11,716	11,559	11,683
Amount of surface disturbance associated with installation of compressors (acres)	754	1,700	1,677	1,695
Total surface disturbance (acres)	14,128	37,975	31,432	31,771
Amount of reclaimed surface (acres) <sup>1</sup>	13,194	13,194	13,194	13,194
Net amount of surface disturbance (acres)	934	24,781	18,238	18,577

Note: (1) Does not include plugged and abandoned wells that await approval for reclamation.

Surface disturbance, especially bare soil on unpaved roads, is a major contributor to changes in sediment yield in a watershed. Actual sediment yields resulting from projected oil and gas development and other surface disturbing activities could not be quantified for this analysis because site-specific locations of the new wells, roads, pipelines, compressors, and trails would be needed. It has been shown through a recent study (Phippin 2000) in the Rio Puerco watershed in Sandoval County, New Mexico, that sediment yields are highly sensitive to changes in the density of unpaved roads. In a commonly used procedure to estimate sediment yields from large watersheds (PSIAC 1968), approximately 8 percent of the sediment yield predicted is influenced by the

amount of ground cover. In general, it can be concluded that areas with the highest density of development, the least ground cover, and the most erodible soils would generate the highest sediment yields. Therefore, the analysis focuses on quantifying changes in surface disturbance, amount of vegetation disturbed, and road density, with the assumption that increased sediment yields would be related to increases in these watershed parameters.

**Table 4-2** shows the amount of initial surface disturbance estimated for each watershed under each alternative. **Table 4-3** estimates the increase in new roads within each watershed by alternative.

**Table 4-2. Initial Surface Disturbance from Oil and Gas Development under  
Each Alternative by Watershed**

Watershed	Alternative A		Alternative B		Alternative C		Alternative D	
	New Well Sites	Initial Surface Disturbance (acres)	New Well Sites	Initial Surface Disturbance (acres)	New Well Sites	Initial Surface Disturbance (acres)	New Well Sites	Initial Surface Disturbance (acres)
Animas	389	1,230	1,166	3,685	874	2,763	874	2,763
Arroyo Chico	0	0	0	0	0	0	0	0
Blanco	301	950	903	2,855	670	2,141	677	2,514
Carrizo	465	1,470	1,394	4,406	1,037	3,304	1,046	3,879
Chaco Wash	32	100	95	300	71	225	71	264
Chinle	0	0	0	0	0	0	0	0
Gobernador	189	597	566	1,790	418	1,342	424	1,576
Kutz Canyon	123	388	368	1,163	276	872	276	1,024
La Plata	304	961	911	2,879	683	2,159	683	2,534
Largo	810	2,561	2,427	7,669	1,816	5,754	1,811	6,756
Mancos	0	0	0	0	0	0	0	0
Middle San Juan	143	451	428	1,352	321	1,014	321	1,190
Navajo Reservoir	552	1,744	1,679	5,347	1,182	4,010	1,256	4,707
Pump Canyon	150	473	448	1,416	336	1,062	336	1,246
Rio Chama	7	23	21	5	16	5	16	5
Rio Puerco	1	4	3	9	3	10	3	12
Rio San Jose	0	0	0	0	0	0	0	0
Upper Puerco	0	0	0	0	0	0	0	0
Upper San Juan	955	3,019	2,866	9,065	2,133	6,798	2,148	7,981
<b>Total</b>	<b>4,421</b>	<b>13,971</b>	<b>13,275</b>	<b>41,941</b>	<b>9,836</b>	<b>31,459</b>	<b>9,942</b>	<b>36,451</b>
<b>Total acreage to be revegetated</b>		<b>4,598</b>		<b>13,806</b>		<b>10,229</b>		<b>10,339</b>

Table 4-3. Increase in New Roads under Each Alternative by Watershed

Watershed	Alternative A		Alternative B		Alternative C		Alternative D	
	Miles of New Roads	% Change	Miles of New Roads	% Change	Miles of New Roads	% Change	Miles of New Roads	% Change
Animas	31	3%	94	10%	71	8%	71	8%
Arroyo Chico	0	0%	0	0%	0	0%	0	0%
Blanco	24	4%	73	13%	54	10%	55	10%
Carrizo	38	5%	113	14%	84	11%	85	11%
Chaco Wash	3	0%	8	0%	6	0%	6	0%
Chinle	0	0%	0	0%	0	0%	0	0%
Gobernador	15	6%	46	18%	34	13%	34	13%
Kutz Canyon	10	5%	30	16%	22	12%	22	12%
La Plata	25	6%	74	17%	55	13%	55	13%
Largo	66	2%	196	7%	148	5%	147	5%
Mancos	0	0%	0	0%	0	0%	0	0%
Middle San Juan	12	1%	35	2%	26	1%	26	1%
Navajo Reservoir	45	4%	136	13%	96	9%	102	9%
Pump Canyon	12	6%	36	18%	27	13%	27	13%
Rio Chama	1	0%	2	0%	1	0%	1	0%
Rio Puerco	0	0%	0	0%	0	0%	0	0%
Rio San Jose	0	0%	0	0%	0	0%	0	0%
Upper Puerco	0	0%	0	0%	0	0%	0	0%
Upper San Juan	76	3%	232	10%	173	7%	174	7%
<b>Total</b>	<b>358</b>		<b>1,075</b>		<b>797</b>		<b>805</b>	

Under this alternative, initial surface disturbance is estimated to total approximately 13,971 acres due to new wells, roads, and small pipelines, in addition to the surface disturbance resulting from construction of large pipelines and compressors shown in Table 4-1. Without knowing the locations of the proposed large compressors and lateral and trunk lines, it is not possible to determine which watersheds would receive the impacts of this construction, except to assume that the majority of the earthmoving would be located in the high development area in the northern part of the

planning area (Map 2-1). The largest anticipated acreage of surface disturbance would be in the high intensity oil and gas development area in the Upper San Juan, Largo, Navajo Reservoir, Carrizo, Animas, La Plata, and Blanco watersheds, in descending order.

Under this alternative, there would be an increase ranging between 12 and 77 miles of new roads in 11 of the 19 watersheds, resulting in an increase in unpaved roads ranging from 1 to 6 percent in those watersheds. The total increase would be approximately 358 miles in the planning area, which would result in a slight

increase in sediment yield overall, with the largest increases anticipated in the same watersheds that would have the highest surface disturbance from new well locations and pipelines.

Most of the soils in the watersheds with the most acreage of predicted surface disturbance and new road construction are moderately to highly erodible due to rainfall and surface water runoff. Most of these watersheds are in the low to moderate category for wind erosion. It is likely that significant erosion and sedimentation would be caused by increased initial surface disturbance, which would be reduced once well pads, roads, and pipelines are stabilized by seeding and the establishment of surface water controls and other BMPs.

### **Geology and Minerals**

The primary impact to mineral resources under all alternatives would be the irretrievable commitment of oil and gas resources in the San Juan Basin. The hydrocarbons produced from federal lands would no longer be available for future use. Extraction of oil and gas resources in the planning area would vary according to the ability to access subsurface hydrocarbon resources under each alternative.

### **Oil and Gas Leasing and Development**

Access to hydrocarbon reserves in a particular formation is regulated by spacing and density rules. Well spacing units and the option to perform infill drilling affect the ability to extract mineral resources. The RFDS anticipates that spacing and/or density rules would be altered over the 20-year period of analysis to maximize extraction of hydrocarbon resources. For example, the Fruitland Coal is currently drilled on 320-acre spacing. It is expected that spacing may be decreased to 160 acres, particularly outside of the high development area. The Dakota formation is currently spaced at 320 acres, with one infill well allowed. It is expected that the spacing may be decreased to 80 acres in

order to maximize extraction of its gas resources.

The application of constraints associated with specially designated areas can affect the ability to access the surface to drill a well. Some stipulations can preclude use of the surface for drilling, such as the conditions of “no surface occupancy.” The minerals beneath an area with a NSO restriction may not be accessible unless the reserves can be accessed through directional drilling. Other stipulations can impose use conditions, such as “controlled surface use” or “closed to new leasing.” Use restrictions can be imposed by different factors, including wildlife use, which may result in seasonal timing limitations.

The amount of gas or oil produced under each alternative depends upon the number of completions associated with the alternative. Approximately 84 percent of these wells would be located on FFO BLM land, 10 percent on AFO BLM land, 1 percent on USBR land, and 5 percent on USFS land.

The analysis focused on gas reserves contained in the major gas-producing formations in the San Juan Basin because of their relative importance as compared to oil production. In order to assess how much gas would be produced under each alternative, the analysis used RFDS estimates of the reserves remaining in each of the major-producing formations. The following assumptions were made to allocate those reserves to each alternative:

- The amount of remaining hydrocarbons was assumed to be producible within the 20-year period of analysis. It is likely that full production would take longer than 20 years, but the RFDS did not provide a timeframe for the ultimate depletion of the various reservoirs, so this assumption was used as the most severe condition for analysis of environmental impacts. It provides a relative basis for estimating the impacts to production by alternative.
- The amount of producible hydrocarbons corresponds to the number of possible completions, which approximately



- corresponds to the number of possible locations under Alternative B.
- The number of potential completions under Alternatives C and D would be approximately the same as for Alternative B, but more use would be made of alternative drilling and production techniques (commingling, dual completions, directional drilling, etc.). The number of total completions for all alternatives was reduced by the number of locations that would be removed from use by the application of surface stipulations.
  - The number of locations in Alternatives A and B is approximately equal to the number of completions.
- Remaining reserves for the Pictured Cliffs, Mesaverde, Dakota, Chacra, and Fruitland Coal were provided in the RFDS. The RFDS also provided estimates for the subsurface development associated with Alternative B (Engler et al. 2001). Ratios of available locations to possible locations were generated and applied to the estimated remaining reserves for each formation to provide production estimates for each alternative, shown in **Table 4-4**.

**Table 4-4. Estimated Future Production by Alternative**

	Remaining Production Estimates from RFDS	Alternative A	Alternative B	Alternative C	Alternative D
Estimated number of wells after stipulations		4,421	13,275	9,836	9,942
Formation	Estimated Future Production in Billion Standard Cubic Feet (Bscf)				
Fruitland Coal	1,167	514	1,167	1,151	1,164
Pictured Cliffs	441	194	441	435	440
Mesaverde	6,034	2,655	6,034	5,950	6,016
Dakota	3,368	1,482	3,368	3,321	3,358
Chacra	148	65	148	146	148
<b>Total</b>	<b>11,158</b>	<b>4,910</b>	<b>11,158</b>	<b>11,002</b>	<b>11,125</b>
<b>Percent of Total</b>	<b>---</b>	<b>44%</b>	<b>---</b>	<b>98.6%</b>	<b>99.7%</b>

This analysis provides a relative comparison of production under each alternative. Therefore, under Alternative A, produced gas would be approximately 44 percent of the amount produced under Alternative B. Under Alternatives C and D, the amount produced would be approximately 98 and 99 percent, respectively, of the amount produced under the Alternative B.

Implementation of Alternative A would limit accessibility to hydrocarbon reserves by limiting APD approval to approximately 223 per year.

A total of 4,421 new wells would be developed under this alternative. NSO restrictions would require 73 directional wells (1.7 percent of the total) to be drilled to access reservoirs under specially designated areas and Navajo Lake. The actual number of wells approved would be limited by the spacing and density rules for the formations and the locations of the existing wells in the area. Once the P&A wells are taken into account over the 20-year period, there would be no net increase in surface disturbance, and possibly a decrease. The

number of wells awaiting approval for reclamation in the FFO backlog would probably decrease over the period of analysis if FFO surface management staff devotes time to inspection of reclaimed sites. There would be 53,216 acres closed to new leasing.

The limiting factor in production would be the number of wells permitted. Under those conditions, the inability to drill infill wells would not affect resource extraction. Approximately 44 percent of the available gas would be produced under currently accepted technologies. The discontinuance of pilot programs that evaluate innovative techniques to enhance production would further limit extraction of hydrocarbon resources.

On USBR lands, after consideration of the surface constraints near Navajo Reservoir, 58 directionally drilled wells could allow access to hydrocarbon reserves located beneath the reservoir and adjacent land.

Small quarries of less than 5 acres are frequently excavated to supply sandstone and gravel for stabilizing roads to oil and gas wells. Consequently, it is anticipated that an increase in the number of new well pads would increase the number of quarries in the high development area. Therefore, the smallest number of small quarries would be constructed under Alternative A. These small quarries would be located in areas that avoid impacts to natural and cultural resources, permitted by FFO staff either with an APD or through other BLM permitting procedures.

#### **Land Ownership Adjustments**

Under current management, 280,782 acres of public land would be available for disposal, of which approximately 264,797 acres contain federal minerals, mostly located in the areas identified as suitable for coal mining. If this land leaves federal ownership, there would be a potential for complications in extracting these minerals because coordination between the non-federal landowner and the federal mineral manager would be required. The issues surrounding the management of split estate are discussed further under Lands and Access.

There is the potential for conflicts between competing resource users if oil and gas wells and associated infrastructure limit access to the most desirable salable minerals areas located in the vicinity of the tri-cities area, which is also within the high development oil and gas area. Locatable minerals would not be affected by oil and gas development. These potential large quarries would also be required to go through the FFO permitting process that includes cultural, T&E species, and paleontological resource clearances.

#### **Specially Designated Areas**

The primary effect on oil and gas development from the designation of special areas is the limitation imposed in these areas for how the surface resources would be managed within their boundaries in the FFO. Due to NSO constraints within specially designated areas, there would be 1 well that would not be accessible and approximately 15 wells that could be developed if directional drilling were used.

#### **Coal Leasing Suitability Assessment**

There would be fewer potential conflicts for mineral extraction, especially in the coalbed methane-producing formations, under this alternative because the total number of oil and gas wells approved over the next 20 years would be the lowest of all the alternatives. Conflicts over leases and operations arise when gas and coal are found in the same coal seam. Areas identified as suitable for coal development are those within the Coal Belt SMA, the 14 PRLAs, and the 17 competitive coal tracts carried forward from previous land use planning. No new lands would be considered for coal leasing outside of these previously designated areas. These areas are outside of the high development oil and gas area, but conflicts would still have the potential to arise in the Fruitland Formation mineral resources. The unsuitability criteria, established by the MLA, and adjudication of some of the PRLAs would have the potential to further reduce the 138,000 acres of federal minerals available for coal mining in these areas.

The renewed interest in the vicinity of Star Lake is in an area with few oil and gas wells projected. Management of the coal program would be implemented as it is currently, so that any land under new application for mining would be evaluated against the unsuitability criteria (Appendix C), and an RMP amendment would be completed to evaluate the site-specific impacts. The Coal Belt SMA would remain, but approval of any mining in this area would require the same evaluation as in other areas under FFO management.

### **Soils**

The alternatives would generate impacts on soils by contributing to soil erosion or compaction from earthmoving activities and OHV use. There is also a potential for changes to prime farmland soils.

The analysis of impacts on soils examined activities associated with each alternative that could increase erosion or compaction or affect prime farmlands. The removal of vegetation and organic matter from the soil surface, and damage to soil crusts, would cause accelerated soil erosion by water and wind. The construction of new unpaved roads would result in many areas that would concentrate the flow of surface water and contribute additional sedimentation from the road surface and road banks. The amount of water erosion depends on such factors as the terrain at the site of the surface disturbance, the erodibility and permeability of each soil type, vegetative cover, the steepness and length of the slope at the site, and the amount of precipitation.

The amount of wind erosion would also be affected by the location and type of barriers to the prevailing winds at the site. Without knowledge of the exact locations of surface disturbance, it is impossible to predict the quantity of soil that would be lost due to the site-specific nature of soil erosion prediction methods.

Indirect impacts would include the potential for increased salinity and sedimentation in waterways due to erosion. The Upper San Juan watershed contains a relatively high proportion

of saline soils compared to others in the planning area and is the area of the highest projected surface disturbance due to oil and gas development. Others with saline soils in the San Juan Basin subject to potential surface disturbance and resulting erosion are the La Plata, Animas, and Middle San Juan watersheds.

Soil compaction is caused by heavy equipment, especially if the soil contains a high proportion of silt and clay or when it is wet. Soil compaction would result in damage to soil crusts, decreased soil permeability and plant rooting depth, and increased surface water runoff, contributing to accelerated erosion and flooding downstream. Compaction would make revegetation of disturbed areas more difficult. Other localized impacts to soils include mixing of soil horizons and possible contamination of soils from various chemicals and other pollutants used during oil and gas activities.

Prime farmland soils are found in five of the watersheds projected to have high amounts of new oil and gas activity, including Upper San Juan, Navajo Reservoir, La Plata, Animas, Pump Canyon, Middle San Juan, and a small amount in Chaco Wash. Excavation of topsoil and compaction of prime farmland soils would result in changes to these soils unless the soil horizons are stockpiled separately and spread across the site in their original order during reclamation.

### **Oil and Gas Leasing and Development**

Due to the lower numbers of projected new well locations, roads, and pipelines, this alternative would have the least short-term and long-term impacts on soils from oil and gas activity. Initial short-term surface disturbance from construction of new wells, pipelines, and roads would be approximately 13,971 acres, with 4,598 acres revegetated after construction (Table 4-2). When accounting for the reclamation of P&A wells and roads, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be over 900 acres (Table 4-1). The resulting impacts to soils would be a slight

increase in soil erosion due to the increase in bare ground and unpaved roads, without taking into account the P&A backlog that could reduce long-term surface disturbance acreage. There is the potential for impacts to prime farmlands due to construction associated with oil and gas development because the watersheds with the most prime farmland soils are within the high development area for oil and gas.

### **OHV Use**

Open OHV access over most of the FFO area would result in damage to vegetation and soil crusts, and an increase in tracks that could turn into new roads. As vegetation is damaged on sloping terrain, tire tracks oriented up and down the hillside often concentrate surface water runoff during storm events, which develop into gullies. BLM staff has documented damage to vegetation and resulting erosion after an OHV event in the FFO area (O'Neill 2001). Increased soil erosion would also be expected to result where OHVs are permitted to ride on existing trails because they would increase soil compaction and further reduce vegetative cover.

### **Coal Leasing Suitability Assessment**

Impacts to soils have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Coal Belt SMA. A majority of the potential coal mine areas are located within the Chaco Wash watershed, which would have the greatest chance of being affected if additional coal mining were approved. The majority of this watershed is moderately susceptible to water erosion and has low susceptibility to wind erosion, both of which would be accelerated if new coal mining operations were started.

Inclusion of BMPs in future coal leases to reduce surface water runoff and erosion would be required to meet state and federal regulations and would minimize accelerated erosion. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species are

preferred but not required under this alternative. Site-specific impacts on soils from new coal leasing would be evaluated in project-specific EAs before issuance of the leases by the BLM.

### **Water Resources**

Criteria used for evaluating impacts to water resources are related to water quality, water availability, and adherence to applicable local, state, and federal regulations. Impacts were evaluated by their potential to impair water quality; reduce water availability to users; endanger public health or safety by creating or worsening health hazards of safety conditions; or violate laws or regulations adopted to protect or manage water resources. Impacts to surface water resources would be considered significant if local, state or federal water quality standards were exceeded, or changes in surface flow exceeded normal maximum or minimum levels as a result of the action. Impacts to groundwater resources would be considered significant if aquifers were altered sufficiently to affect established uses, water quality were degraded below applicable water quality standards, or the quantity of usable groundwater were diminished as a result of the action.

In general, direct impacts to surface waters would result from an increase in surface disturbance, which could result in an increase in sedimentation in water bodies. Vegetative cover serves as a buffer between the impacts of erosive forces such as rain, wind, and surface water runoff to hold soil in place. As vegetation is removed (through construction activities, OHV use, etc.), soil becomes exposed to these erosive forces. During storm events these soil particles are transported downslope and into drainages. The closer the surface disturbance is to a water body, the more likely it is for sedimentation to enter a water body and affect water quality. When vegetation is disturbed along the riparian corridor, erosive forces can have detrimental impacts to channel stability, resulting in increased bank erosion, channel scour, and sedimentation.

### **Oil and Gas Leasing and Development**

The primary issues and concerns regarding water resource problems caused by oil and gas development involve the potential for increased runoff and resulting sedimentation from surface disturbance; water consumption and use; and groundwater contamination associated with various activities from oil and gas development. Increased runoff and associated sedimentation of local drainages could result from and increase in the areal extent of disturbances associated with well, road, and pipeline construction.

Well construction could affect surface water within the immediate vicinity of drill pads and road and pipeline construction could affect surface water along the ROWs. These localized impacts would result from accelerated erosion during storm events that occur when the soil is exposed. The magnitude of potential impacts would be dependent, in part, on seasonal variation in rainfall and snowmelt runoff when the surface disturbance occurs. Should runoff events occur at times when the surface soil is bare, there would be a higher potential for increased sediment yield, which affects water quality. The magnitude of potential impacts would also depend on the proximity of the drill site, pipeline, or road to receiving bodies of water. If there is a sufficient vegetative buffer between the surface disturbance and any receiving water body, the impacts would be less.

Potential impacts to surface water quality also could occur from accidental contamination associated with spills of machinery fuels, lubricants, and drilling fluids. The potential for impacts to groundwater quality would be limited to drilling, well development, well testing activities, contamination from infiltration of polluted water in unlined pits, and disposal of produced water into injection wells.

During the well-drilling phase, impacts to water resources include the potential to contaminate a freshwater zone. So as to protect near-surface aquifers, surface casing is installed to a depth of up to 500 feet, depending on the

depth necessary to penetrate past the freshwater zones. The casing is pressure tested to ensure a seal has been created to protect the freshwater zones.

As drilling proceeds, losses of produced water or mud may occur to differing degrees in various formations, but these losses are considered to be minimal and contained to within a few feet of the well bore. These losses are not considered to be substantial because of the very small amount of groundwater that could be affected. It would be unlikely for groundwater contamination to occur as a result of drilling activities.

All water produced in association with Fruitland CBM production would be transported via truck or pipelines to an injection well, or evaporation ponds, for disposal. Injection of produced water is consistent with BLM policy and the USEPA's Underground Injection Control permit Program (40 CFR Part 144). When water is disposed of underground, it is always introduced into a formation containing water of equal or poorer quality or a formation that has been specifically exempted by the NMOCD.

In general, the STCs required to be implemented by the federal agencies would minimize the potential for impacts to groundwater quality.

All alternatives would require some fresh water for well drilling. Drilling operations would account for most of the water actually consumed during the life of the producing wells. A small amount of water would be used for dust suppression or equipment installation during other phases of development. Recirculating mud systems or produced water would be used to reduce the total volume of water needed where appropriate and applicable. Fresh water used in drilling operations would be obtained from the San Juan and Animas Rivers, Navajo Reservoir, local municipalities, and/or from wells drilled specifically for this purpose. The water would be trucked to the location from its source to the reserve pits at each drilling well.

The amount of water used during drilling would depend on the technique used to drill the well bore. Wells that are drilled by using air or another gas as the primary drilling medium require less water than those drilled with mud. Formations that contain greater amounts of fluid, such as the CBM-producing Fruitland formation, are usually drilled with mud to maintain the integrity of the well bore.

The average amount of water needed for drilling and completion differs per formation, ranging from 2,000 barrels (67,200 gallons; 1 barrel = 42 gallons) for Pictured Cliffs to 10,000 barrels for the Mesaverde. Water requirements differ depending on the technique and the formation. The average amount of water needed for drilling and completion of all wells, weighted by the percentage of wells in each of the major formations in the planning area, is approximately 6,750 barrels per well. According to the RFDS (Engler et al. 2001), this amount can be decreased by 25 percent to account for dual completions and commingling because only one well bore is drilled for two wells. If completing a different formation or zone, an additional 10 percent of the amount of completion water would be needed after the initial hole has been drilled. After applying these corrections, the average water usage for drilling used throughout this Draft RMP/EIS is 5,600 barrels.

Under Alternative A, new oil and gas development would result in a slight net increase in surface disturbance. Water required for the drilling operations would amount to 3,191 acre-feet, assuming 5,600 barrels per well would be needed.

In general, potential impacts to water resources would result from an increase in sedimentation due to surface disturbance. These would be minimized through the use of BMPs and pollution prevention measures as required by federal and state regulations. There would be a slight long-term net increase in sedimentation because development of new drilling sites would result in reclamation of old sites. There would be a slight increase in potential impacts to water resources in the short

term as a result of sedimentation, due to initial increased acreage of surface disturbance during construction.

### **Land Ownership Adjustments**

Modification of the BLM ownership pattern would not directly impact water resources. Depending on the modifications implemented, indirect impacts to water resources could result. For instance, the non-federal in-holdings within a designated River Tracts SMA would be targeted for acquisition by the BLM, which could have indirect impacts to water resources due to restrictive management guidelines that would limit surface disturbing activities. Conversely, disposal of BLM land for development in the tri-cities area could result in an increase in water use in the region, if the land were to be developed for public use.

Potential uses of any land that would be transferred under Alternative A are currently unknown. Therefore, it is not possible to analyze potential impacts to water resources. When these uses are proposed, subsequent NEPA analysis would be required to determine the specific impacts.

### **OHV Use**

The primary concern regarding OHV impacts on water resources is the potential for increased runoff and resulting erosion and sedimentation due to vegetation degradation and surface disturbance caused by OHVs. Other concerns include the potential for small fuel spills from OHVs, and OHV travel in riparian areas or surface waters, which would increase sedimentation through mechanical degradation of the riparian vegetation and/or channel bank.

Potential impacts to water resources from cross-country OHV travel would result from an increase in sedimentation due to surface disturbance. The primarily open designations for OHVs in the FFO area would adversely impact vegetation condition and soil crusts, which in turn, would result in increased runoff and sedimentation of waterways. The level of impact would depend on the specific location and season of OHV use. Use of unpaved roads

and trails can create gullies in which rainfall is channeled, resulting in increased flow rate, which ultimately results in increased erosion and subsequent sedimentation of surface waters. Localized impacts to water resources would continue to occur on lands where cross-country travel is permitted.

### **Specially Designated Areas**

Specially designated areas are delineated to allow for particular uses in areas that are considered to be ecologically appropriate for the given use, while restricting activities that would negatively impact the identified resource value to be protected. Depending on the location of the area, there is a potential to positively affect water resources through improved land management practices and restriction of surface disturbance, which would result in improved vegetative cover, protection of soil crusts, reduction in road development, and a resulting minimization of sedimentation. In situations where OHV cross-country travel would be permitted within a specially designated area, a localized negative impact to water resources could result. The management prescriptions in the majority (91) of specially designated areas provide some measure of restriction for OHV access and minimization of overall surface disturbing activities. This protection would be provided in a small percentage (less than 20 percent) of the total FFO area, however.

### **Coal Leasing Suitability Assessment**

Impacts to surface water and groundwater quantity and quality have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Coal Belt SMA. A majority of the potential coal mine areas drain to the Chaco River, which would have the greatest chance of being affected if additional coal mining were approved.

Installation and maintenance of BMPs to reduce surface water runoff and erosion would be required according to BLM policy to meet state and federal regulations. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils,

minimize erosion, and reduce the spread of weeds. Native species are preferred but not required. Site-specific potential impacts from new coal leases would be evaluated in project-specific EAs before approval would be granted by the BLM.

### **Air Quality**

The primary impact to air quality from the project alternatives would occur from proposed natural gas development and production. This section describes the analysis used to estimate potential air quality impacts from this development, in addition to potential impacts from proposed changes in OHV designations. The changes proposed for coal leasing, land ownership patterns, and specially designated areas would have minimal effects on air quality so they are not addressed in this section.

This air quality analysis includes an evaluation of near-field pollutant impacts from gas production, with the use of dispersion modeling to determine whether proposed emissions contribute to an exceedance of an ambient air quality standard. Information on project emission sources was obtained from gas industry representatives, equipment vendors, the NMAQB, and recent NEPA documentation of gas development in the region (SAIC 2002a). The air quality analysis also qualitatively evaluates the impact of proposed gas production emissions to pristine PSD Class I areas in proximity to the planning area. Detailed estimates of equipment usage and resulting emissions for each project alternative, in addition to supporting data that documents the near-field modeling analysis are included in an Air Quality Technical Report (SAIC 2002a). Appendix J presents data used to estimate annual air emissions from the RMP/EIS alternatives.

Alternative B proposes the greatest amount of gas development and therefore potentially would produce the highest air quality impacts of any project alternative. Therefore, the air quality analysis focused on the impacts from Alternative B, and impacts from all other project alternatives were factored from impacts

estimated for this alternative. If impacts from Alternative B would not exceed any air quality standard, it is expected that this would be the case for all other project alternatives.

For the purpose of conducting a reasonable, but conservative, air quality analysis, it was assumed that all new wells would extract natural gas. The following activities would produce air quality impacts under all of the project alternatives:

1. Gas well development, including well drilling, testing, and construction of roads, well pads, pipelines, storage tanks, and compressor stations. Air quality impacts would occur from (a) combustive emissions due to the operations of mobile and stationary source equipment and (b) fugitive dust emissions ( $PM_{10}$ ) due to earthmoving activities and the operation of vehicles on both unpaved and paved surfaces. This activity would produce short-term impacts, as the time to complete individual wells is generally between one and two months.
2. Gas well production and the operation of associated gas-fired sources, such as wellhead compressors, water separator units, condensate tank heaters, dehydrators, and compressor stations. Air quality impacts would also occur due to combustive emissions and fugitive dust emissions from the operation of mobile source equipment that accesses well sites operating on both unpaved and paved surfaces.
3. Gas well abandonment, use of mobile equipment, and reclamation of disturbed ground surfaces.
4. Operation of mobile source equipment for overburden and coal handling and stationary coal handling equipment. Air quality impacts would occur from combustive and fugitive dust emissions.
5. Land use policies that would affect the level of off-road mobile sources and ground-disturbing activities on FFO lands.

The air quality analysis in this RMP/EIS includes the following assumptions:

1. Annual well development would occur at a constant rate equal to the total number of wells proposed under each alternative, divided by 20 years.
2. Production for each well under an alternative would occur at a constant annual rate regardless of age (year one and up to year 20). In other words, all developed wells would have the same annual production rate. The estimate of annual well production was based on the total number of well-years over a 20-year period divided by the total production proposed under each alternative. As a result, peak annual production and emissions from each alternative would occur at the end of the 20-year period of analysis.
3. Loss of production and its associated emissions from P&A wells during the 20-year project period would offset a portion of the production and its associated emissions from each project alternative. To estimate the net change in production and emissions within the region due to a project alternative, the loss in production from P&A wells was subtracted from the production assumed for a project alternative. With an annual growth rate of 5 percent, the number of P&A wells would increase from 133 in year 1 to 336 in year 20, with a total of 4398 P&A wells over the 20 year period. The annual production per P&A well was calculated to be the existing production in the project region (1.1 trillion standard cubic feet [Tscf]) divided by the number of existing wells (19,790), then divided by 2 to represent



the reduced production associated with these old wells.

### **Oil and Gas Leasing and Development**

Alternative A proposes to develop 4,421 new gas wells on federal lands, which would produce approximately 3,718 billion standard cubic feet (Bscf) of gas over the 20-year life of the alternative. **Table 4-5** presents the emissions that would occur from gas production under Alternative A for the first and last year of the 20-year period. These data show that the

overwhelming majority of emissions from this activity would occur from wellhead and central compression demands. Implementation of Alternative A would result in a gradual increase in gas production and associated emissions from current levels in the San Juan Basin, as the loss of production in future years from existing wells and formations due to P&A wells would not completely offset the amount of new production from the Alternative.

**Table 4-5. Project Year 1 and Year 20 Annual Air Emissions Associated with Gas Production—Alternative A (Tons per Year)**

Equipment Type/Scenario	VOC	CO	NOx	PM <sub>10</sub>
<b>Project Year 1</b>				
Wellhead Compression	25.8	1,124.4	1,133.0	0.0
Separator Units	0.4	2.7	6.3	0.5
Central Compression	24.7	67.7	86.1	0.0
<b>Alternative A - Tons per Year</b>	<b>50.9</b>	<b>1,194.8</b>	<b>1,225.4</b>	<b>0.5</b>
<b>P&amp;A Wells - Tons per Year</b>	<b>(8.3)</b>	<b>(340.9)</b>	<b>(344.9)</b>	<b>(0.2)</b>
<b>Alternative A Net Change (Alt A – P&amp;A)</b>	<b>42.6</b>	<b>853.8</b>	<b>880.5</b>	<b>0.4</b>
<b>Project Year 20</b>				
Wellhead Compression	517.0	22,487.8	22,660.1	0.2
Separator Units	7.4	53.5	125.7	10.2
Central Compression	493.4	1,354.3	1,721.7	0.1
<b>Alternative A - Tons per Year</b>	<b>1,017.7</b>	<b>23,895.5</b>	<b>24,507.5</b>	<b>10.4</b>
<b>P&amp;A Wells - Tons per Year</b>	<b>(273.7)</b>	<b>(11,273.8)</b>	<b>(11,404.7)</b>	<b>(5.1)</b>
<b>Alternative A Net Change (Alt A – P&amp;A)</b>	<b>744.1</b>	<b>12,621.7</b>	<b>13,102.7</b>	<b>5.3</b>

Source: Engler et al. 2001.

Note: Totals do not sum due to rounding.

Near-field ambient pollutant impacts due to gas production under Alternative A could approximate those estimated for Alternative B, if the density of development in a localized area for Alternative A was similar to what was assumed for Alternative B. This situation would occur in the vicinity of a high concentration of gas wells and a compression station. However, the potential for this to occur under Alternative A would be low, as the amount of development

proposed for the alternative is substantially less than the development proposed for Alternative B.

### **OHV Use**

Operation of OHVs can produce air quality impacts as a result of combustive and/or fugitive dust emissions. Continuation of the present OHV policies under Alternative A would not be expected to result in any

significant air quality impacts. The impact of greatest concern from this activity would be intense vehicular usage that would occur in concentrated areas adjacent to residential areas or roadways.

#### **Coal Leasing Suitability Assessment**

Coal mining can result in the generation of fugitive dust and equipment emissions that have the potential to affect air quality. If new mines are opened as old ones are reclaimed, no new significant impacts to air quality would be anticipated beyond current conditions. If increased acreage of coal mines are approved, impacts on air quality may occur. When site-specific locations of new coal mines are known, EAs would be developed to analyze the impacts and mitigation measures may be identified in the permitting process.

#### **Upland Vegetation**

The amount of land currently and potentially affected by oil and gas development and operations was determined through GIS analysis. The acreage of wetland and riparian habitat in the planning area was derived from existing documentation. Information on projected ground disturbance from Tables 4-1 and 4-2 was used to assess impacts on upland and wetland and riparian vegetation.

#### **Oil and Gas Leasing and Development**

Most of the existing wells in the planning area are in the piñon-juniper woodlands and Great Basin Desert Scrub plant communities. The amount of long-term vegetation disturbance within the planning area for new wells, roads, pipelines, and compressors on public land would be over 14,000 acres (Table 4-1). Initial short-term surface and vegetation disturbance during construction would affect almost 14,000 acres, of which 4,600 acres would be reseeded once regular operations begin. The specific locations of the new wells and other facilities are not known but most would be constructed in the high development area containing primarily piñon-juniper woodlands and Great Basin Desert Scrub plant community types. Areas that are reseeded

would not return to their original plant cover types in the 20-year period of impacts considered, resulting in direct impacts to vegetation. Surface disturbance facilitates the germination of noxious weeds, and equipment that travels from site to site transports weeds, resulting in the spread of noxious weeds if left uncontrolled.

#### **Land Ownership Adjustments**

Approximately 280,800 acres would be available for disposal and 128,000 acres for acquisition under Alternative A (Table 2-1 and Map 2-2). The disposal of land could have negative effects on upland and riparian vegetation if land disturbance activities were to take place. Biological surveys would be conducted on parcels of land designated for disposal to identify sensitive habitats and species. If sensitive plant communities were identified in these parcels, measures to reduce the impacts on these areas could be taken, such as exclusion of specific parcels of land from consideration for transfer and placing restrictions on the use of transferred land. Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on upland and riparian plant communities especially if the land were acquired in support of a resource program such as riparian areas along the rivers and washes on FFO land.

#### **OHV Use**

OHV travel in upland plant communities can result in direct plant mortality and indirect effects through soil disturbance and the promotion of increased erosion. The amount of land open to OHV use under Alternative A would be 1,230,839 acres (Table 2-2). The remaining FFO land would be closed or limited for OHV use. The continuation of OHV use in open areas would result in the continued degradation of upland plant communities.

#### **Specially Designated Areas**

There would be no modification or addition of specially designated areas for biological resources under Alternative A. Many of the

areas have management prescriptions that limit vegetative disturbance such as surface disturbing activities, OHV access, or grazing. This management would continue to protect vegetation in a limited part of the FFO.

#### **Coal Leasing Suitability Assessment**

Specific locations of new coal lease areas on FFO land have not been identified. Coal leases have the potential to affect a large amount of land; the currently permitted sites cover over 3,900 acres. Proposed coal operations would go through the NEPA process and site-specific analysis of the proposed project impacts on upland vegetation would be performed at that time.

#### **Riparian Areas and Wetlands**

The acreage of wetland and riparian habitat in the planning area was derived from existing documentation. Information on projected ground disturbance from Tables 4-1 and 4-2 was used to assess impacts on upland and wetland and riparian vegetation.

#### **Oil and Gas Leasing and Development**

The only specific constraints on oil and gas development that would protect riparian areas are the CSU constraints within approximately 2,500 acres of public land in the River Tracts SMA. There are many other riparian areas within the planning area that could be affected by oil and gas development through surface disturbance, construction, and removal of vegetation. While it is impossible to quantify the impacts to riparian areas without knowing the locations of well, road, pipeline, and compressor sites, it is anticipated that there would be impacts to riparian areas from wells to be installed in the high development area, although the impacts under Alternative A would be the least because the projected well numbers would be less than under the other alternatives. Any construction along the edge or across water bodies or wetlands would be required to meet state and federal requirements for sediment and erosion control, and the developers would be required to obtain permits from the USACE and the New Mexico

Environment Department (NMED) in compliance with Section 404 of the CWA and Section 401 of the New Mexico Water Quality Control Act (NMWQCA).

#### **Land Ownership Adjustments**

Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on upland and riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes on FFO land. Designated FFO riparian areas such as the River Tracts SMA would not be included in land being considered for disposal.

#### **OHV Use**

OHV use of the river tracts and other protected riparian areas on FFO land is limited to designated roads and trails. OHV traffic in intermittent washes would be allowed unless specifically prohibited (Table 2-3). This traffic can result in the elimination of vegetation in and along the washes, resulting in increased erosion and runoff. The continuation of OHV traffic in dry washes would continue to degrade these areas.

#### **Specially Designated Areas**

CSU constraints in 56 specially designated areas under Alternative A would assist managers in avoiding riparian and wetland areas because they can require that oil and gas operations be moved in order to minimize impacts to specific resources.

#### **Coal Leasing Suitability Assessment**

Coal mining operations would not take place in significant wetland and riparian habitat because these areas would be screened out during the application process. There is the potential that coal extraction activities could lead to increased erosion and resulting sedimentation in riparian areas, although few exist in the area identified under Alternative A for coal mining. Coal mining has the potential to directly affect arroyos, and permits for such activities may be required. The potential for this impact would be assessed in a project-specific NEPA document. It is not anticipated that coal

mining would significantly affect riparian areas, but site-specific analysis would be required once a location has been requested for consideration before this could be accurately addressed.

### **Special Status Species**

Measures are in place to protect species listed and proposed for listing under the ESA that are known to occur or have the potential to occur in the planning area. Such measures are also in place for some of the other special status species. Given the protective measures in place as part of continuing management guidance, the implementation of the revised RMP may affect, but is not likely to adversely affect, the species and critical habitats listed below. Detailed species analysis and justification of species effects determinations are contained in the Biological Assessment developed for this RMP/EIS as part of formal consultation with the USFWS.

### **Oil and Gas Leasing and Development**

Formal consultation with the USFWS under the ESA of 1973 as amended was completed for the 1988 RMP and the 1991 RMP Amendment and stipulations and management practices established at that time would be continued to conserve these species. It is believed that oil and gas development under this alternative would not result in adverse effects to listed or proposed species or the adverse modification of critical habitat. The BLM would continue its current management of non-federally listed species with the goal of contributing to the conservation of these species to reduce the potential for their being listed under the federal ESA. BLM's proactive management practices for these species are described above.

### **Federally Listed and Proposed Species**

Knowlton's cactus. A fence protects the population of wild Knowlton's cactus on FFO land and no disturbance inside the fence would be allowed. The Knowlton's cactus transplant and seed plots on FFO lands are fenced and protected from disturbance. Unoccupied

potential Knowlton's cactus habitat within 3 miles of the wild population receives special management. Roads and well pads would not be authorized in unoccupied potential habitat and pipeline rights-of-ways are authorized only after extensive biological surveys are conducted and stringent rehabilitation of disturbed ground is required.

Mesa Verde cactus. All known and potential habitat for the Mesa Verde cactus on FFO land are contained in the Hogback ACEC. There are several populations of the Mesa Verde cactus within the Hogback ACEC boundary. Extensive biological surveys would be required for all proposed projects and no ground disturbance activities in known or potential Mesa Verde cactus habitat is allowed.

Mancos milkvetch. All known populations and potential Mancos milkvetch habitat on FFO land occur in the Hogback ACEC. Extensive biological surveys would be required for all proposed projects that would result in ground disturbance and no ground disturbance is allowed in known or potential Mancos milkvetch habitat.

Colorado pikeminnow and razorback sucker. Until 1987, the Colorado pikeminnow and razorback sucker were considered to be extirpated from the San Juan River due, in part, to activities associated with the construction of Navajo Dam and the Navajo Indian Irrigation Project from 1962 through 1965. Since 1987, 14 adult and 20 young-of-the-year pikeminnow have been captured in the San Juan River and its tributaries, between Lake Powell and Shiprock, New Mexico. No wild Colorado pikeminnow or razorback suckers have been detected in the planning area. Concerns regarding the potential for oil and gas development activities to result in polynuclear aromatic hydrocarbon (PAH) releases into the aquatic habitat in the planning area resulted in the FFO initiation of a study of potential releases of PAHs into the environment. This study began in 1994 and after 7 years of study, the FFO's preliminary conclusion is that the oil and gas leasing program is not contributing PAHs to the San

Juan River via surface runoff or groundwater migration (Wirth 2001). Developers and operators of the oil and gas facilities on BLM land in the San Juan River basin would continue to follow BMPs to prevent erosion and the escape of contaminants from their operations.

Bald eagle. Oil and gas development and operations have the potential to affect wintering bald eagle through the direct loss of habitat or disturbance of birds from human activity. The core areas in each Bald Eagle ACEC unit would be closed to further surface disturbance from oil and gas development or other activities. The buffer zones would be closed to drilling, exploration, and other surface disturbance from November 1 through March 31, but new wells can be developed at other times. Maintenance and operation of existing wells in the core area and buffer zone take place currently and would continue to take place. Developers are discouraged from siting well pads in the buffer zones so it is anticipated that few, if any, new wells would be constructed in the buffer zone. If wells would be constructed in the buffer zone, it is assumed that each well would result in the disturbance of about three acres of land. The potential loss of habitat in the buffer zone would not represent the loss of wintering bald eagle use areas because the buffer zone is designed to protect the wintering bald eagles from human disturbance, and prohibition of drilling, exploration, and other human disturbance in the buffer zone and core areas between November 1 and March 31 greatly reduces the potential of human disturbance of wintering bald eagles. In addition, the complete prohibition of oil and gas development in the core area would prevent loss of wintering bald eagle habitat in the ACEC units. Therefore, activities associated with oil and gas development would have little effect on wintering bald eagles in the Bald Eagle ACECs on BLM and USBR land. Wintering bald eagles are more dispersed on USFS land. Oil and gas development would not affect these birds because these operations would not be allowed during the winter. The construction of oil and

gas facilities would not be allowed in steep canyons that support ponderosa pine and Douglas fir, which provide potential nocturnal roost sites for wintering bald eagles.

Mountain plover. Surveys were conducted for the mountain plover on potential habitat on FFO land between 1998 and 2000, and one adult with a chick was found on FFO land. Approximately 12,000 acres of designated potential mountain plover habitat have been identified on FFO land in the southern portion of the FFO area outside the area of intense oil and gas development. The designated potential habitat receives special management for the mountain plover. Proposed projects inside the designated potential habitat are subject to timing limitations that consist of no surface disturbance during the mountain plover nesting season from April 1 to July 31. For projects that take place during the nesting season, biological surveys for the mountain plover would be required. If plovers were found near the proposed oil and gas well or the facility, site-specific constraints would be developed to ensure that the project would have no negative impacts on plovers. Projects that would create a permanent noise source with the potential to affect a known plover nesting area would be subject to noise mitigation requirements.

Mexican spotted owl. No Mexican spotted owls have been detected on FFO land. Surveys for the Mexican spotted owl on FFO land began during the summer of 1992, in which all potential habitat on FFO land was evaluated and prioritized. These surveys followed the USFS survey protocol (USFS 1996), resulting in no spotted owls being detected. Potential habitat was surveyed again in 1993 and no spotted owls were detected. After 1993, the highest priority habitats on FFO land were surveyed periodically using nocturnal call counts and no spotted owls were detected. Mexican spotted owl critical habitat was designated on FFO land in March 2001 (USFWS 2001) and surveys following the USFS protocol once again failed to result in the detection of the spotted owl. No spotted owl

Protected Activity Centers (PACs) exist on FFO land.

The designated Mexican spotted owl critical habitat on FFO land was surveyed and analyzed during the summer of 2001 to establish Reference Conditions of the habitat as outlined in the Mexican spotted owl Recovery Plan (USFWS 1995). Three habitat types were established and mapped: 1) mixed conifer, 2) ponderosa pine, 3) piñon-juniper. Out of the 2,617 acres of critical habitat on FFO land, seven small stands of mixed conifer habitat were identified. These stands ranged from 2.3 to 33 acres and totaled 85.7 acres (3.3 percent of the critical habitat). Six stands of ponderosa pine covering 349.5 acres (13.4 percent of the critical habitat) were also identified. The remaining 2,182 acres of the critical habitat (83.4 percent of the total) was classified as piñon-juniper.

Oil and gas exploration and production have occurred on the designated Mexican spotted owl critical habitat since the late 1950s. All of the critical habitat has been leased for oil and gas exploration and held by production. There are currently 23 active wells and 5 abandoned well pads on the critical habitat. The potential exists for more roads and more well pads to be built in the critical habitat under all alternatives. However, the 85.7 acres of mixed conifer habitat have not been impacted by oil and gas exploration due to the steep and rugged topography of the canyons that support the habitat, so the implementation of Alternative A would not be expected to affect the Mexican spotted owl critical habitat.

Southwestern willow flycatcher. Surveys for the southwestern willow flycatcher began on FFO land in 1993 and after 9 years of surveys, no breeding southwestern willow flycatchers have been detected on FFO land. There are no historic records of this species ever breeding on land administered by the FFO or on nearby lands. The greatest threat to this species is habitat loss and the FFO administers about 7 percent of the willow flycatcher potential habitat along the San Juan, Animas, and La Plata Rivers in the planning area. This land occurs in

small widely scattered parcels surrounded by private lands, which are increasingly being developed for residential uses.

Implementation of the Farmington Southwestern Willow Flycatcher Habitat Management Plan (BLM 1998a) serves to protect FFO lands along the rivers and creates islands of habitat that may improve towards potential willow flycatcher habitat over time. It includes measures to protect potential habitat to ensure that there would be no net loss of potential southwestern willow flycatcher habitat from oil and gas development or other ground disturbance activities. It is believed that there would be no net loss of potential willow flycatcher habitat resulting from implementation of Alternative A.

### **Other Special Status Species**

Oil and gas development and other authorized actions would have little or no effect on most (24) of the special status species, primarily because many of their populations are located outside the major area of oil and gas development or because their habitats would be protected from such development.

Aztec gilia and Brack's fishhook cactus would have the potential to be affected by oil and gas development because they occur within the high development area. Their potential habitat would continue to be identified and delineated on a conflict map maintained by the FFO staff. The conflict map would be checked before the initiation of any ground disturbing activity, and a biological survey would be required in potential Aztec gilia and Brack's cactus habitat. If populations of these species are found, mitigation for negative impacts would be required.

The San Juan tiger beetle was recently added to the USFWS list of species of concern and currently FFO has no special management requirements developed. To minimize its impacts in the future, FFO will cooperate with other agencies to develop a management strategy for the San Juan tiger beetle, if necessary.

The roundtail chub inhabits portions of the San Juan River system. It is believed that oil and gas development, as well as other activities on FFO land, would not result in negative impacts to this species because 1) oil and gas development activities on FFO land do not appear to result in PAH contamination of the aquatic habitat, 2) oil and gas developers and others would adhere to BMPs required by the FFO, and 3) riparian areas under the administration of the FFO would be protected.

There are 12 species of sensitive birds that have the potential to occur in the planning area. Baird's sparrow, black tern, harlequin duck, and white-faced ibis are occasional visitors and would not be impacted by FFO-administered activities. The flammulated owl has been detected on FFO land during Mexican spotted owl surveys. The northern goshawk has not been detected on FFO lands, although it nests on nearby Jicarilla Ranger District land. Potential habitat for these 2 species consists of mixed conifer and ponderosa pine stands, which would be protected from disturbance by agency management prescriptions and mitigation measures. The loggerhead shrike is common on FFO land in suitable habitat and does not require special management. The gray vireo is a state-listed threatened species commonly found in suitable habitat in the planning area, so special management has not been required.

The American peregrine falcon occurs in the planning area and receives special management. Surveys are conducted for the peregrine falcon to locate active breeding sites that would be managed to minimize disturbance.

The ferruginous hawk occurs on FFO land and receives special management, along with the golden eagle and prairie falcon. Annual surveys would continue to be conducted to find and monitor nests. All active nests receive special management. No oil and gas facilities that have the potential to disturb these nesting raptors would be authorized within 1/3 mile of an active nest during the nesting season. Noise mitigation measures would be applied to

protect active nests from constant noise sources such as compressors.

Information on the western burrowing owl has been collected on FFO land since 1999. Most burrowing owls are associated with prairie dog towns and a field study has been initiated to locate prairie dog towns on FFO land. All prairie dog towns would be delineated on a conflict map. When a project is proposed at or near a prairie dog town, surveys for prairie dogs and burrowing owls may be required. If an active prairie dog town and/or burrowing owl habitat have the potential to be affected, appropriate constraints or mitigation measures would be developed and implemented.

The yellow-billed cuckoo, known to nest in cottonwood/willow riparian areas, was recently designated as a candidate species by the USFWS. This species has been detected along the San Juan River and FFO plans to initiate a survey during the spring of 2002 to determine if the cuckoo occurs in FFO river tracts. All of the FFO riparian areas that may be cuckoo habitat along the river system currently receive special management through the implementation of the Riparian and Aquatic Habitat Management Plan (BLM 2000b) and the Southwestern Willow Flycatcher Habitat Management Plan (BLM 1998a).

Bat surveys were conducted on FFO land in 1996 and 1997 (Gannon 1997, 1998a). Bats were sampled during 34 netting nights at 12 locations in 1996, in which a total of 293 bats of 10 different species were captured. These captures included 4 federal species of concern (small-footed myotis, long-eared myotis, long-legged myotis, and Yuma myotis), as well as the acoustically detected federal- and state-listed spotted bat, and the federal species of concern big free-tailed bat. The 1997 season included 31 netting nights at 14 locations and resulted in the capture of 125 bats of seven species, in which 4 federal species of concern were captured (Townsend's big-eared bat, small-footed myotis, long-eared myotis, and long-legged myotis). Most roost sites found were in large boulders or cliff crevices. FFO would require biological surveys for

construction projects that may affect cliffs or large boulder habitats that may contain a bat roost site. Currently, there are no known large roost sites on FFO land but, if such a roost site were found during biological surveys, appropriate mitigation measures would be required.

The New Mexico jumping mouse is not known to occur on FFO land but potential riparian habitat for this species is currently protected (BLM 1998a, 2000b).

#### **Land Ownership Adjustments**

Land ownership changes planned under Alternative A would not be expected to affect special status species. Surveys would be required to determine whether special status species are located within a parcel under consideration for disposal. Land disposal would not be approved without mitigation if it would affect sensitive species or their habitat.

#### **OHV Use**

Under this alternative of continuing current management, OHV use would be restricted in specially designated areas that protect threatened and endangered species, such as the closed designations in The Hogback ACEC, in which Mesa Verde cactus and Mancos milkvetch are known to occur. Due to the large amount of land (over 1.2 million acres) where cross-country OHV travel would be permitted, it is possible that OHV access could affect special status species until their existence and habitat are identified by FFO staff during surveys, and OHV travel is restricted throughout the appropriate process and environmental document.

#### **Specially Designated Areas**

No modifications or additions to specially designated areas for special status species would occur under Alternative A. There are 5 areas specifically designated for the protection of special status species: The Hogback ACEC, Aztec Gilia ACEC, Bald Eagle ACEC, River Tracts SMA, and Reese Canyon RNA.

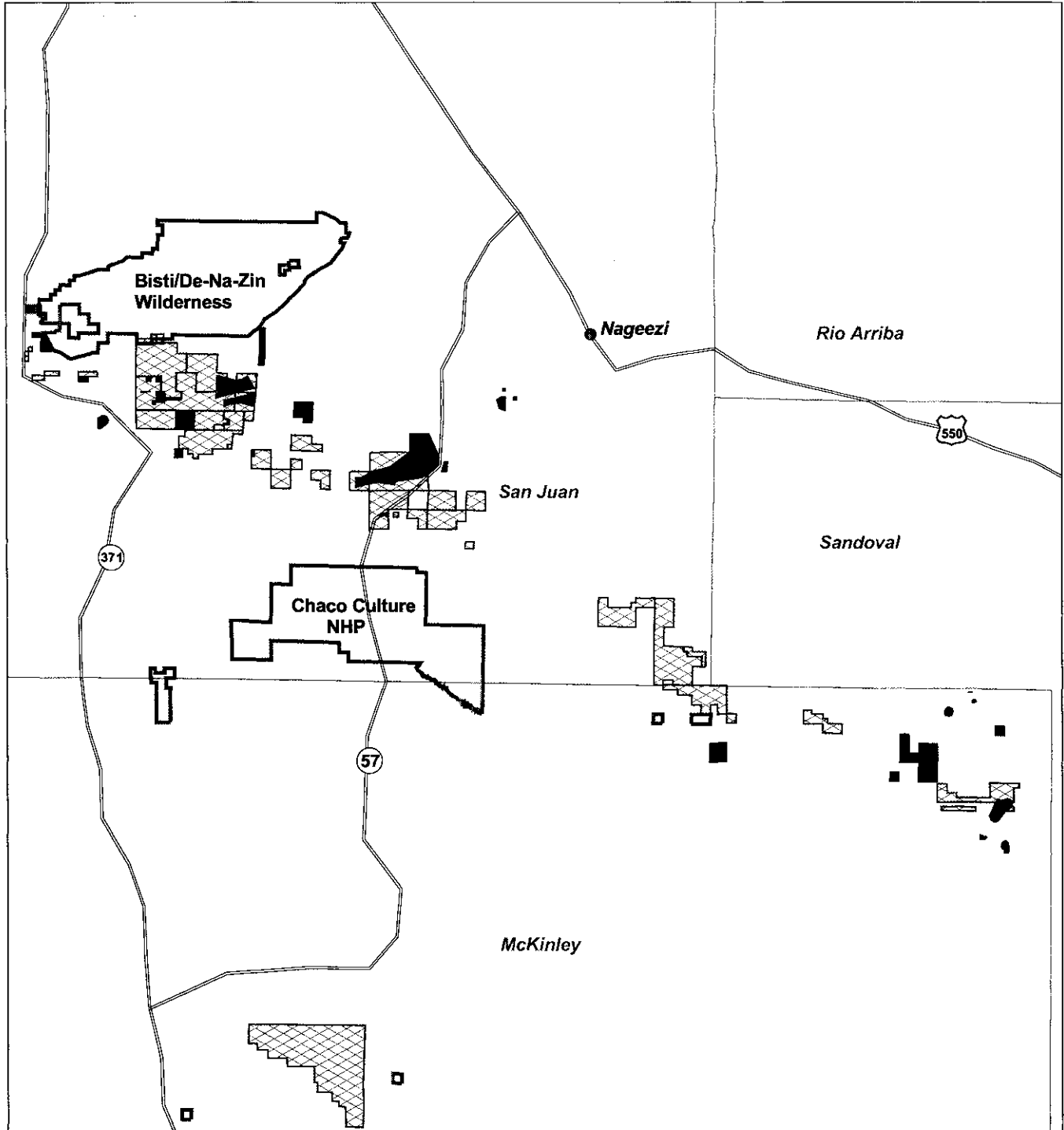
#### **Coal Leasing Suitability Assessment**

The development of land suitable for coal development under Alternative A has little or no potential to affect federally listed species or designated critical habitat. Knowlton's cactus occurs near Navajo Reservoir, outside the location of the PRLAs, competitive lease tracts, and Coal Belt SMA. The Mesa Verde cactus and Mancos milkvetch are within The Hogback ACEC, which would not permit coal mining. Potential Colorado pikeminnow, razorback sucker, and southwestern willow flycatcher habitat, as well as federally designated pikeminnow critical habitat along the San Juan River in the River Tracts SMA, would not be affected if coal mining were approved because they would be eliminated through the application of the unsuitability criteria. The Bald Eagle ACEC units and the Mexican spotted owl potential and federally designated critical habitats on FFO land are not close to potential coal mining areas.

The mountain plover is a federal proposed species that may occur in the area of potential coal mining, as shown on **Map 4-1**. Many of the PRLAs and competitive lease tracts occur near or within the plover potential habitat. Coal mining in and near potential mountain plover habitat would require plover surveys to be completed before applications to mine would be approved. In addition, consultation with the USFWS would be required when site-specific applications to mine coal on FFO land are received, in compliance with the ESA, so it is anticipated that mitigation measures would be required to minimize impacts.

Coal mining under Alternative A has the potential to impact non-federally listed or proposed sensitive species, but potential impacts would be assessed in a project-specific environmental document and the types of protective measures to be implemented would be determined at that time.

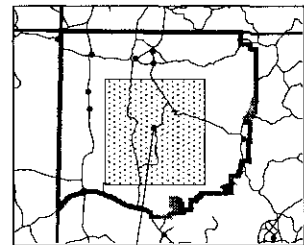
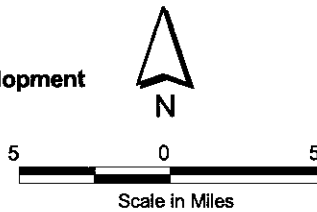




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**LEGEND**

- Mountain Plover Habitat
- Area of Coal Interest/Potential Development
- Town
- Major Road
- County Boundary
- State Highway



Area Shown

Source: Reeves 1998, 1999c, 2000

**Map 4-1: Potential Coal Mining Areas  
in Mountain Plover Habitat**

## **Fisheries and Wildlife**

Information on fish and wildlife was obtained from biologists working for the federal agencies in the planning area. Quantitative data regarding the effects of oil and gas development and operations on wildlife was obtained from GIS analysis. Background information regarding the impacts of various activities associated with oil and gas development on wildlife was obtained from the pertinent literature and conversations with agency biologists.

Activities associated with oil and gas development can affect wildlife and their habitat during exploration, development, operations, and abandonment (Bromley 1985). This analysis concentrates on the development and operational processes that occur from habitat alteration and the long-term presence of human activity. Oil and gas operations have the potential to impact wildlife through the direct loss of habitat and disturbance by human activity. Long-term habitat loss would occur from construction of permanent facilities such as well pads, roads, pipelines, and compressor stations. Even after parts of the well pads, roads, and pipelines are revegetated, the piñon-juniper and Great Basin Desert Scrub plant communities that comprise much of the potentially affected habitat would not be reestablished for many years.

The effects of oil and gas development activities on fisheries could involve physical or chemical changes to streams. A long-term study of PAHs associated with gas wells in the planning area has shown that these contaminants are not migrating off site and entering perennial or ephemeral drainages (Wirth 2001). Current and proposed oil and gas development and operation activities would continue to contribute to increased turbidity in perennial streams and ephemeral drainages. Given that the fisheries and other aquatic organisms in the rivers within the planning area evolved in highly turbid conditions, especially during high flow events, increased turbidity from oil and gas activities may not have a

negative effect on them. For these reasons, it is believed that oil and gas well development and operations would not likely have an effect on fisheries and other aquatic resources.

Additional effects of oil and gas development on terrestrial flora and fauna can result from dust, noise, increased human activity due to greater road access, and habitat fragmentation. Although human activity would occur at the well pads and compressor stations on a regular basis, this analysis concentrates on the effects on roads because the road network is expected to be a larger contributor to the fragmentation of habitat within the planning area than the other facilities, and would generate potentially greater impacts from dust and human activity. This fragmentation was analyzed in terms of habitat loss due to road construction as well as in terms of the functional habitat loss that may occur along roads due to human activity.

It has been established that ecological effects of roads are generally negative (Forman 2000). Roads can prevent or hinder the movements of small species of wildlife such as amphibians, reptiles, and small mammals (Gibbs 1998, Trombulak and Frissell 2000). Studies of the effects of major highways on birds have shown reduced density for some species, due mainly to noise levels, not visibility of vehicles (Reijnen et al. 1995, 1996). Ferris (1979) determined that there were no significant effects on breeding bird density attributable to an interstate highway in Maine, but he did find that some forest interior species were less common and some edge species were more common within 100 meters of the highway. For this analysis, it is assumed that the effects of roads and other facilities on song birds are much less than found in the above studies because the traffic volumes are much lower. Human activities along roads may disrupt nesting raptors such as the northern goshawk and golden eagle (Reynolds et al. 1992, Trombulak and Frissell 2000).

A summary of some of the literature shows that ungulates may be affected by roads depending on their distance from roads (Rost

and Bailey 1979, Rowland et al. 2000, Dyer et al. 2001), road density (Lyon 1983, Unsworth et al. 1998, Millspaugh et al. 2000), vehicle use levels (Cole et al. 1997, Dyer et al. 2001), road distribution and management (Cole et al. 1997, Rowland et al. 2000), surrounding habitat and terrain (Unsworth et al. 1998, Rowland et al. 2000, Dyer et al. 2001), season (Millspaugh et al. 2000, Rowland et al. 2000), sex and age of animals (Unsworth et al. 1998), and hunter use (Cole et al. 1997, Millspaugh et al. 2000).

The avoidance of roads by large species of mammals has been documented to result in the functional loss of habitat and reduced carrying capacity (Dyer et al. 2001, Rowland et al. 2000). Such avoidance behavior has been observed for mountain lions (*Felis concolor*), mule deer, and elk (Dyer et al. 2001, Rost and Bailey 1979, Lyon 1983, Rowland et al. 2000, Van Dyke et al. 1986). Rost and Bailey (1979) found that deer and elk avoid roads particularly within 200 meters and Forman (2000) also assumed a 200-meter (656-foot) disturbance zone on each side of secondary roads. Hershey and Leege (1976) and Ward (1976) found reduced habitat use by elk within 0.25 mile (1,320 feet) of roads. There appears to be little information on the effects of roads on pronghorn antelopes, although Ward (1976) found that pronghorn antelope were apparently not affected by traffic along an interstate highway. Ungulates such as mule deer and elk tend to avoid habitat along well-traveled highways to a greater extent than lighter traveled secondary roads (Ward 1976), and it is assumed the same holds true for pronghorn.

Analysis is concentrated on mule deer and elk because their habitat is already fragmented, and additional oil and gas development has the potential to negatively affect their habitat. The analysis also considers pronghorn antelope and other wildlife to a lesser degree.

Studies regarding ungulate avoidance of roads have not been conducted on land within the planning area, but given the widespread documentation of this phenomenon, it is assumed that mule deer and elk would avoid most open roads. Based on information in the

literature, it was assumed that deer may avoid habitat within 660 feet of roads and elk within 1,320 feet of roads. These distances were used to determine the potential functional habitat loss along roads, which does not equate to the total abandonment of the habitat but to reduced use of the habitat. For example, elk use of habitat within 1,320 feet of an interstate highway was 20 percent of the habitat use farther away; along gravel secondary roads, it was about 44 percent of habitat use farther away (Ward 1976). In the analysis, the number of habitat fragments were also determined within 0.5 mile from roads because security cover of contiguous tracts of land over 250 acres in size and at least 0.5 mile from the nearest road may be important for elk during hunting season.

This analysis of impacts on wildlife under the alternatives concentrates on the land in the high development area on FFO land. The analysis also addresses oil and gas development on USFS, USBR, and AFO land, but to a lesser degree. Within the high development area, the focus of analysis is on the 397,000 acres of public land in the 13 Wildlife Areas proposed under Alternatives C and D. The impacts within these areas are discussed under all alternatives to provide a means for comparison across alternatives. These areas are used because they encompass the major wildlife use areas and contain the 134,000 acres currently managed by the FFO, identified as Critical Big Game Habitat under Alternatives A and B (Table 2-5).

### **Oil and Gas Leasing and Development**

There are currently an estimated 1,886 miles of roads within the boundaries of the wildlife areas that are the focus of analysis, 1,650 miles of which are on public land. In the 397,000 acres of public land in wildlife habitat, the road density averages approximately 2.6 miles per square mile (mi/mi<sup>2</sup>). There are an estimated 4,528 existing wells that, along with roads and pipelines, have resulted in the long-term loss of almost 19,000 acres of habitat, or 4.8 percent of the area (**Table 4-6**).

**Table 4-6. Estimated Functional Habitat Loss and Projected Levels of Disturbance on Public Land in the Proposed Wildlife Areas on FFO Land<sup>1</sup>**

Disturbance Category	Oil and Gas Facilities <sup>2</sup>				Functional Habitat Loss <sup>3</sup>			
	Roads		Wells <sup>4</sup>		Total <sup>5</sup>		660-foot Road Effects Zone	
	Miles (mi/mi <sup>2</sup> )	Acres Disturbed	Number	Acres Disturbed <sup>4</sup>	Acres Disturbed <sup>5</sup>	% of Total Area <sup>6</sup>	Acres Affected	% of Total Area <sup>7</sup>
Current Disturbance	1650 (2.6)	9,900 <sup>8</sup>	4,528	9,056	18,956	4.8%	238,400	46%
Projected Disturbance								
Alternative A	44 (0.1)	- <sup>9</sup>	542	1,712	20,668	5.2%	245,440 <sup>10</sup>	47%
Alternative B	296 (0.5)	-	3,653	11,546	30,502	7.7%	285,760 <sup>10</sup>	55%
Alternative C	219 (0.4)	-	2,712	8,570	27,525	6.9%	273,600 <sup>10</sup>	52%
Alternative D	220 (0.4)	-	2,712	8,570	27,525	6.9%	273,600 <sup>10</sup>	52%
							462,190 <sup>10</sup>	88%
							391,790	75%

Notes: (1) Proposed wildlife management areas would not be part of Alternatives A and B; only some would be part of Alternative D. The current and projected acreage disturbed in these areas is shown under each alternative for comparative purposes.

(2) Includes oil and gas facilities only on public land.

(3) Functional habitat loss indicates habitat in the area of roads that is potentially used to a lesser degree than habitat further away from roads. Functional habitat loss was assessed for zones of 660 and 1,320 feet on each side of the roads.

(4) Current disturbance assumed 2 acres per existing well. Projected disturbance acreage calculated as described under Watersheds in Chapter 4.

(5) Total equals land disturbed for new wells, roads, and pipelines, plus current land disturbance.

(6) Total area equals 397,000 acres of public land within the 13 proposed wildlife areas.

(7) Total area equals 523,700 acres of public and non-public land within the boundaries of the 13 proposed wildlife areas. Non-public as well as public land is included in the functional habitat loss analysis because big game and other wildlife move freely between public and non-public land.

(8) Assumes 6 acres disturbed per mile of road using a 50 foot right-of-way.

(9) Acreage of land disturbed for new roads for each alternative is included in the acres disturbed for new wells.

(10) Acreage for alternatives = current functional habitat loss + estimated additional functional habitat loss estimated due to implementation of the alternatives. Likely an over-estimation of functional habitat loss because location of new roads is not known and some new roads would occur in areas already included in the existing functional habitat loss acreage.

Functional habitat was calculated for public and non-public land in the 13 proposed Wildlife Areas because big game and other wildlife move freely between public and non-public land. The total area within the 13 Wildlife Areas is approximately 523,700 acres. Functional habitat loss in this area is estimated to be 238,400 acres (46 percent of total), when taking into account all areas within 660 feet of roads and 391,790 acres (75 percent) within 1,320 feet of roads (Table 4-6). In other words, an estimated 46 percent of the approximately 523,700 acres of wildlife habitat occurs within 660 feet of a road and 75 percent within 1,320 feet of a road. This land may be receiving less use by mule deer and elk, and perhaps by other species of wildlife, than areas further than 1,320 feet from roads.

Current habitat fragmentation by roads and three roads effects zones were calculated for all of the land within the 13 proposed Wildlife Areas (523,700 total acres) (Table 4-7). Habitat fragments were calculated for land at least 0.5 mile from the nearest roads because such habitat may be important to elk as escape cover during the hunting season (Millsbaugh et al. 2000), and this also likely applies to mule deer. Elk habitat should be a contiguous area of at least 250 acres at least 0.5 mile from the nearest road. The percentage of habitat fragments outside roads and the road effects zones ranges from 98 percent of the habitat in fragments created by roads alone to 4 percent of the habitat created by the 2,640-foot road effects zones (Table 4-7).

**Table 4-7. Current Number and Average Size (Acres) of All Habitat Fragments and Fragments 250 Acres or More in Size Created by Roads and the Road Effects Zones in the Proposed Wildlife Special Management Areas on FFO Land<sup>1</sup>**

Fragment Categories	All Fragments			Fragments 250 Acres or More		
	Number	Average Size (acres)	% of Total Area <sup>2</sup>	Number	Average Size (acres)	% of Total Area <sup>2</sup>
Fragments created by roads alone	832	616	98%	186	2,585	92%
Fragments outside the 660-foot road effects zone	700	381	53%	198	1,226	46%
Fragments outside the 1,320-foot road effects zone	699	167	22%	105	845	17%
Fragments outside the 2,640-foot road effects zone	163	131	4%	25	635	3%

Notes: (1) Refers to 13 wildlife areas proposed for Alternative C.

(2) Total area equals approximately 523,700 acres of public and non-public land covered by 13 proposed wildlife areas on FFO land. Percent of total area refers to area of land covered by fragments created by roads alone and the percent of total area covered by habitat fragments outside the three different road effects zone categories.

Analysis of habitat fragments 250 acres or more shows a broad range in number, average size, and percent of habitat available outside the effects zones, depending on the fragment category considered. There are an estimated 25 habitat fragments of 250 acres or more totaling over 15,800 acres at least ½ mile from the nearest roads (Table 4-7), covering only 3

percent of the total area. Supporting information on the current amount of habitat disturbed, the projected amount of land disturbance, and habitat fragments for each of the proposed 13 Wildlife Areas appears in an unpublished technical report (SAIC 2002b) available at the FFO.

Current oil and gas development also affects mule deer, elk, and other wildlife on USFS land. It is assumed that the impacts of oil and gas development and operations on these wildlife are less than on FFO land because the road density on the USBR land (2.3 mi/mi<sup>2</sup>), Carson National Forest (CNF) (1.6 mi/mi<sup>2</sup>), Santa Fe National Forest (SFNF) (1.4 mi/mi<sup>2</sup>), and AFO land (2.0 mi/mi<sup>2</sup>) are much less than on FFO land. In addition, well density is less on these lands than on FFO land.

It is assumed that the amount of current habitat alteration and loss in the planning area have resulted in a reduction in habitat carrying capacity for mule deer, elk, and other wildlife, but the degree of this reduction is not known. The estimated additional direct habitat loss due to projected oil and gas development under Alternative A (1,712 acres) (Table 4-6) would be likely to further reduce the carrying capacity of the habitat for mule deer, elk, and other wildlife. The level of this reduction cannot be quantified due to 1) incomplete data on mule deer and elk populations in the planning area, 2) variations in animal reactions to vehicle density, road density, and other factors, 3) the lack of site-specific data on the effects of roads on mule deer and elk, and 4) the lack of information on the exact location of new wells and roads. It is concluded that oil and gas development under this alternative would result in a slight reduction of the mule deer and elk populations in the planning area because it would add to habitat fragmentation.

Pronghorn antelope occur principally in the Angel Peak area, covering 42,860 acres of public land with 162 miles of existing roads, a road density of 2.4 mi/mi<sup>2</sup>, and 395 well pads (assuming 6 acres of land disturbed per mile of road, and 2 acres per well). The amount of existing long-term habitat loss is estimated to be over 1,700 acres or 4.1 percent of the area. A total of 70 wells would be developed in this area under Alternative A, and long-term disturbance including roads and pipelines would affect about 220 acres or 0.5 percent of the total area. Functional habitat loss would occur in the Angel Peak area at the levels

described above. Implementation of Alternative A would likely result in negative impacts to the pronghorn antelope due to oil and gas development, but the degree of this impact cannot be quantified because of: 1) lack of information on the location of new roads and wells; 2) lack of site-specific data on the effects of roads on antelope; and 3) variations of animal response to vehicle density, road density, and other factors.

Other species of wildlife that would be displaced by oil and gas development would be those found in the piñon-juniper woodlands and Great Basin Desert Scrub plant communities. Reptile and small mammal inventories have not taken place within the planning area, although some breeding and wintering bird surveys have been completed. Based on census data from other areas, the density of breeding birds in the piñon-juniper woodlands and Great Basin Desert Scrub habitats may range from 60 to 135 pairs per 100 acres (Van Velzen 1979, 1980). Assuming 100 pairs/100 acres, the loss of 1,700 acres of land could result in the long-term loss of habitat for an equal number of pairs of breeding birds. The reclamation of wells over the 20-year period of analysis would partially compensate for this loss, but it is unlikely that the lost piñon-juniper woodlands and Great Basin Desert Scrub habitat would be reestablished during that time.

Under Alternative A, new wells and roads would result in the long-term loss of an estimated 335 acres in the CNF, 6 acres on the SFNF, 70 acres on USBR land, and 500 acres on AFO land. Most of the land that would be disturbed by these activities is in the piñon-juniper woodlands and Great Basin Desert Scrub plant communities. This long-term loss would affect many of the same species as those assessed above for FFO land, including mule deer and elk. Pronghorn antelope do not occur or are very uncommon in these areas. It is believed that the impacts of this alternative on wildlife in these areas would be less than on FFO land due to the lower levels of habitat disturbance.

**Land Ownership Adjustments**

Over 328,000 acres of FFO land would be available for disposal, mostly south of US 550. This acreage is scattered without being concentrated in a particular wildlife habitat area, so the change in ownership is not expected to significantly affect wildlife habitat.

**OHV Use**

Approximately 1,230,000 acres of land would be open to OHV use on FFO land under Alternative A. OHV use can have negative effects on plant communities, and therefore negative effects on wildlife habitat. OHV use also occasionally results in direct wildlife mortality, harassment of wildlife, and wildlife abandonment of an area due to human intrusion. The degree of the effect of OHV use on wildlife on FFO land has not been determined, but since it is assumed that OHV use is greater close to the tri-cities area and decreases with distance from the cities, the greatest amount of use is in marginal wildlife habitat in the tri-cities area and less use occurs in habitat further away from the tri-cities area. There is potential to have negative effects on wildlife from open OHV designations in most of the FFO area.

**Specially Designated Areas**

There would be no additions or modifications to specially designated wildlife habitat areas under Alternative A. The Critical Big Game Habitat management areas would continue to be managed with timing limitations on oil and gas operations between December 1 and March 31 to protect turkeys, elk, and deer populations.

**Coal Leasing Suitability Assessment**

Specific locations of new coal lease areas on FFO land have not been identified. Coal mines have the potential to affect a large amount of land, most of which would not be near the major wildlife habitat areas. Proposed coal mines would go through the NEPA process and site-specific analysis of the proposed project impacts on wildlife habitat would be performed at that time.

**Wilderness**

Wilderness values can be degraded when and if human activities (and the evidence thereof) impair pristine qualities and naturalness. Oil and gas infrastructure and operations and OHV use are expanding in the region and could intrude on natural qualities in protected areas.

Because of the restrictions and protection associated with wilderness designation, no direct impacts are anticipated to the Bisti/De-na-zin WA from any of the alternatives. Direct impacts would only occur if oil and gas development were allowed within the WA or any of the WSAs in the planning area. Only valid existing rights predating enactment of the Wilderness Act (for WAs) and FLPMA (for WSAs) could be developed, and these would be regulated to prevent unnecessary or undue degradation of wilderness qualities. Indirect impacts would occur if activities located outside WAs or WSAs caused conditions that would be noticeable and detrimental to wilderness qualities, such as noise, dust, modifications to surrounding landscape, or ecological changes to a larger area. Cumulative impacts could result from other actions in the region that, combined with actions on public lands, could impair wilderness values.

**Oil and Gas Leasing and Development**

Oil and gas development along the periphery of the Bisti/De-na-zin WA and the Ah-shi-sle-pah WSA could generate noise that indirectly affects natural quiet in some locations within the protected areas. Similarly, development outside these areas could affect viewsheds from locations within the protected areas. Most surrounding areas are VRM Class III and IV, where fewer visual management constraints would be imposed on new development.

The 5 WSAs within the planning area in the AFO are closed to oil and gas development and mineral entry. Any new development in the AFO area would be outside the WSAs and could only have minor indirect effects on peripheral areas.

### **Land Ownership Adjustments and Specially Designated Areas**

Several actions would increase the potential for the Ah-shi-sle-pah WSA to become recommended and ultimately designated as wilderness. These include possible de-selection of acreage within the WSA by Navajo tribe and adjudication of PRLAs (making coal development less likely), inventory of adjacent lands with wilderness suitability and acquisition of these lands, and a revised recommendation to favor wilderness designation. Designation of this WSA as wilderness would add 6,563 acres to the most protected land category within the FFO and ensure that wilderness qualities would be protected for future generations.

If the Ah-shi-sle-pah WSA is designated as wilderness, its 6,563 acres would be permanently withdrawn from mineral leasing. Any leases with valid existing rights would be managed under principles of nondegradation of wilderness values. This would result in added areas with a high degree of protection of natural resources and naturalness and provide more areas for primitive and remote recreational experiences.

Ongoing FFO actions to acquire inholdings (primarily state and tribal lands) will continue in the WA. The larger consolidated wilderness created in 1996 would augment the possibilities for remote experiences, create a more manageable land unit, and lessen the potential for indirect effects from activities on adjacent lands that are not under federal management.

### **OHV Use**

There would be no change in OHV designations that currently close the WA and WSAs to OHV use.

### **Coal Leasing Suitability Assessment**

There is some uncertainty about lands within the Ah-shi-sle-pah WSA that could be de-selected by The Navajo Nation or by adjudication of PRLAs for possible coal development. If adjudication favors the PRLAs, mining of coal would be likely on a large part of the WSA, which would effectively degrade the

natural qualities of this area. Indirect impacts from development on adjacent areas would be possible. Any future coal development of specific tracts of federal land would require further NEPA review prior to a decision. Development on adjacent areas may be regulated to minimize indirect impacts of nearby human activity.

### **Rangeland**

Impacts to rangeland and livestock grazing would occur from any actions that would damage forage, modify land ownership and access to grazing allotments, or require major rangeland improvements in order to continue grazing. Grazing allotments cover most of the FFO area.

### **Oil and Gas Leasing and Development**

Surface disturbance caused by oil and gas development would result in damage to vegetation used for forage and reduction of the acreage available for livestock grazing. Many issues have been raised by grazing permittees regarding poisoning or other physical damage to livestock near oil and gas wells, especially where the well pads are not fenced. Livestock may inhibit reestablishment of reseeded areas around new development by grazing new seedings. Conflict resolution between competing land uses would continue to require mediation by the FFO under all alternatives. Surface disturbance from construction of oil and gas facilities, and the movement of trucks and other equipment from site to site, often accelerate the spread of noxious weeds that can poison livestock and compete with desired rangeland plants.

There would be fewer new well sites under this alternative, so the impacts from oil and gas activity on grazing would be the least of the four alternatives, but there would be a reduction in forage and an increase in the spread of weeds in the high development area.

### **Land Ownership Adjustments**

Land disposal could change the grazing authorization in the FFO area. Most disposal areas would be transferred under R&PP Act



regulations and grazing could be continued. Under Alternative A, most of the land identified for disposal would be located south of US 550, so the grazing allotments in this area would be the most likely to be affected by changes in land ownership.

### **OHV Use**

Unlimited OHV access would continue to damage forage in most of the FFO area. This would lead to loss of topsoil, a reduction of soil quality, and a downward trend of forage in the most used OHV areas. Improving rangeland health to meet the BLM standards would be more difficult to achieve because cross-country travel could damage forage and spread weeds. Open OHV access would continue to generate conflicts between permittees and other land users because it has been shown to result in vandalism of rangeland improvements, cut fences, and harassment of livestock.

### **Specially Designated Areas**

Grazing limitations are identified under some of the specially designated areas within the FFO. Under Alternative A, there would be approximately 10,000 acres in 22 specially designated areas that would limit grazing. These management prescriptions are identified in Table 2-5 under the Grazing heading for each area listed under this alternative.

### **Coal Leasing Suitability Assessment**

Additional coal mining, if approved, would remove more rangeland from forage production and would result in changes to the grazing authorization for the life of the mining operation. There would be the potential for land use conflicts between mining operations and grazing permittees that would require mediation by FFO staff.

### **Lands and Access**

Scoping raised several issues associated with lands and access, focused primarily on potential impacts to private land. These are listed below:

- Noise, visual intrusions, dust, and traffic associated with oil and gas

development and operations can be incompatible with residential and commercial uses.

- The proportion of land in federal ownership in the planning area constrains development, particularly in the growing tri-cities area.
- Oil and gas vehicles cause damage to county roads that serve residences and schools.
- New Mexico's policy on livestock control can cause conflicts between land users where private and public lands interface.
- Private property in split estate situations can lead to land use conflicts when owners are unaware of severed mineral rights.
- Trespass structures and uses occur on public land.
- Open access for motorized vehicles on public land can lessen the suitability of adjacent private lands for residential uses.
- The proliferation of oil and gas field roads is widely seen as a problem both in terms of the environmental and visual damage, and also in providing public access through and in proximity to private land.
- Increased oil and gas development could increase traffic and maintenance needs on the existing road network.

Direct impacts on lands result from physical restrictions and loss (or gain) of land for a specific use. Indirect impacts occur when activities permitted on public land create conflicts with uses on private lands. For example, compressor noise at well sites, dust, and truck traffic related to oil and gas operations can be incompatible with residential uses. Cumulative impacts on land use in the region would result if activities and management of public land, in combination with other uses or foreseeable actions, could displace a valued use, interfere with planned

development, or be detrimental to public welfare or safety.

### **Oil and Gas Leasing and Development**

Access issues in the FFO are primarily associated with oil and gas activities. Concerns include the volume of industry-related traffic on oil and gas service roads, county roads, and state and federal highways; allocation of maintenance responsibilities for roads used mostly by industry; and the proliferation of roads. Some roadways crossing federal land also cross on ROWs through private property. Occasionally, access can be limited when these

roads are gated. Sometimes this occurs when ROWs expire and are not renegotiated with the landowner. Roads can also be closed to protect other resource values.

**Table 4-8** shows the estimated change in vehicular activity from oil and gas field activities for each alternative. Alternatives are compared to a range of current and recent levels of oil field operations that generate between 17,300 and 21,000 average daily well site visits on federal land, and about 23,500 to 27,500 in the San Juan Basin (including non-federal land).

**Table 4-8. Estimated Oil and Gas Well Site Visits by Alternative for 20-Year Planning Period**

	Average Daily Trip Numbers			
	Alternative A <sup>1</sup>	Alternative B	Alternative C	Alternative D
Existing Wells				
Maintain wells (federal)	14,720	Same as Alternative A	Same as Alternative A	Same as Alternative A
Maintain wells (non-federal)	3,680			
Subtotal	18,400			
New Development				
Develop wells (federal)	130	400	300	300
Maintain new wells (federal)	2,440	7,330	5,430	5,490
Develop wells (non-federal)	140	140	140	140
Maintain new wells (non-federal)	2,550	2,550	2,550	2,550
Subtotal	5,260	10,420	8,420	8,480
Total Trips				
Wells on federal land	17,290	22,450	20,450	20,510
Wells on non-federal land	6,370	6,370	6,370	6,370
Total	23,660	28,820	26,820	26,880
Percent change from current levels (federal land) <sup>2</sup>	-16%	+8%	-3%	-2%
Percent change from current levels (all lands) <sup>2</sup>	-20%	+11%	-2%	-2%

Source: BLM 2000e.

Note: (1) Based on trip number per function.

(2) Based on 21,000 visits on federal land and 27,500 visits to all well sites currently.

Well site visits account for development activity (including well, roads, and pipeline construction), annual maintenance on existing and projected new wells, and reductions from

reclaimed wells. They also assume that well field activity occurs 365 days per year. Trips are based on the number of times a specific well site is a destination per year for certain

maintenance functions or development activities. Maintenance may be performed on several wells in a day. While this is counted as several visits, it may in fact reflect one round trip with several “stops” along the way. These numbers are not the same as average traffic levels that are counted for discrete roadways by traffic counters, and therefore cannot be used to estimate additional traffic on a particular roadway. Table 4-8 shows that development on federal land accounts for about two-thirds of the estimated traffic volume from the oil and gas industry in the planning area currently. The trips cannot be attributed to specific roads, and are therefore most useful in estimating relative changes. There are no data on the level of traffic on oil and gas service roads and county roads. It is not known what portion of traffic on state and federal highways is attributable to industry use. It is generally known that county roads 2770, 4490, 4599, 7250 and 4990 are some of the most heavily used roads providing access into the oil and gas fields, and that the majority of the traffic on these roads is related to industry.

Impacts described below focus on overall change in traffic volumes in the planning area from oil and gas activities. The contribution of activities on federal land is provided as a percentage of overall changes.

Oil and gas development under this alternative would continue at the same level as current operations. Over the 20-year period of analysis, about 2,000 wells would be plugged and abandoned, and the sites reclaimed. With projected new development, about 8,130 acres would be disturbed and no longer available for a variety of surface uses. About 300 miles of new oil and gas service roads and 5,200 acres for new pipelines would generally be located within existing ROWs. Where feasible, new major pipelines would be placed in existing utility, communication or highway corridors identified in the Western Regional Corridor Study (1992).

Over 20 years, about 9 large Phase I compressors (over 2,000 HP), about 133 new Phase II well compressors (500 to 2,000 HP),

and 2,230 wellhead compressors (100 HP) would be installed at new sites on land with federal minerals and about 7,200 at existing well sites. These sites would be distributed throughout the high development area and could be located near communities and residences. Noise levels from some of these sites and smaller compressors at specific wells could be incompatible if located close to existing residences. As local noise ordinances are developed to address oil and gas issues, these would be enforceable on new permits within those jurisdictions. In the meantime, municipalities and BLM would continue to resolve noise conflicts on a case-by-case basis. The number of complaints and cases requiring resolution would be likely to increase as a result of the increased density of compressors, particularly near urban areas or communities. Temporary impacts could occur throughout the FFO from construction and development activities, such as noise, dust, and emissions from construction equipment and vehicles, but these would be localized and temporary in nature and have no long-term effect on any particular land use.

Currently, about 11 percent (744,500 acres) of the land within the FFO area has split mineral estate. There are just over 100,000 acres of private land within 3 miles of the tri-cities area incorporated boundaries, and about half this land has split estate. It is expected that the federal government would retain mineral rights to any lands disposed of by sale, exchange, or R&PP transfer. This could increase the amount of land in split estate in the FFO by about 264,800 acres (or 36 percent), increasing split estate from 11 to 15 percent within the FFO administrative area. This would continue to be an issue, particularly for private lands near urban areas where future development options may be constrained by the potential for oil and gas development. Split estate complicates the oil and gas leasing process and therefore does not favor production. In urban areas, the surface land use controls of local jurisdictions would apply lease

terms for oil and gas development on private land.

Where federal oil and gas minerals are developed on non-federal land (split estate areas), there is potential for incompatibility between existing or planned use of the surface real estate, and oil and gas operations with their noise, traffic, and visual appearance. BLM would continue to coordinate with surface owners on suitable conditions of approval on APDs. Local plans or zoning codes can influence the types of conditions that may be incorporated into drilling permits. These would generally provide for management of not only the subject property, but adjacent areas as well. On tribal land, the appropriate tribal office, BIA, and allotment holders, where applicable, would review applications. Issues of conflicting uses, loss of land for specific uses, or access concerns would be considered on a case-by-case basis. Adjustments in well locations, noise reducing measures, or other mitigations may be required to minimize conflicts with surrounding land uses.

Over the 20-year period of analysis, there may be a net increase of about 2 percent in the mileage of roads within the high development area of the FFO. This does not account for restoration or closure of roads as well sites are reclaimed. The projected number of daily trips for Alternative A would be the same or less than current levels from operations on federal land, based on typical fluctuating levels of activity over the last few years. No impact on service capacity of roadways would be caused by this alternative.

The new FFO Roads Committee and program is aimed at dividing fiscal and road maintenance responsibilities fairly between the BLM, counties, and the oil and gas industry. This is expected to improve some of the maintenance problems that have occurred in the past and provide a better and more equitable division of resources. In the meantime, San Juan County will emphasize maintenance on county roads that serve residences and schools. The roads program would inventory the level and type of traffic on

BLM roads and make needed improvements over time.

### **Land Ownership Adjustments**

Land would be available for disposal or transfer south of US 550; however, fewer land adjustments are expected in the future. This is due to the depletion of desirable acquisition lands through a series of successful exchanges since 1988 RMP was completed. BLM land in the tri-cities area would still be available under R&PP Act applications. Disposals from the 1988 RMP would be carried forward (listed in Appendix F) and land south of US 550 would generally be available for exchange. All disposals would be reviewed for consistency with BLM and local plans and objectives. Disposal should provide a greater public benefit for appropriate use of land resources and may be implemented when the disposal does not conflict with resource protection and manageability of public lands. The BLM would generally maintain any existing valid mineral rights, increasing potential for split estate conditions. As such, development options on split estate lands may be constrained by the potential for future oil and gas development.

Acquisition of up to 127,782 acres of inholdings would consolidate federal ownership, particularly in locations with distinctive resource values. This should make these areas easier to manage and improve access to public lands. Management prescriptions may limit use on some acquired lands (such as for grazing, future mineral access and leasing, or cross-country vehicular traffic). Under the FFO road program, BLM would retain any needed ROWs on disposal properties, therefore sales, exchanges, and transfers of land should not impact existing access. Acquisition of inholdings in specially designated areas would generally improve continuity of access due to consolidated ownership.

### **OHV Use**

Conflicts among OHV users, private property owners, and ranchers arising from unlimited cross-country vehicular access would

continue under ongoing OHV policy. It is possible that some additional roadways would be closed to protect wildlife or other resources values as plans are developed for each OHV management unit.

### **Specially Designated Areas**

BLM would attempt to acquire 127,782 acres of inholdings and any underlying non-federal mineral rights within the boundaries of specially designated areas. The acquired lands would be managed under the public land laws and any management prescriptions applicable to the contiguous public lands. Acquisition of inholdings would consolidate federal ownership, particularly in locations with distinctive resource values. This should make these areas easier to manage and improve access to public lands.

### **Coal Leasing Suitability Assessment**

Any future applications to lease land in the FFO for the purpose of coal mining, whether in the competitive lease tracts, the Coal Belt SMA, or PRLAs (when and if adjudicated), would need to be screened for suitability. This process would eliminate the potential for incompatible mining activities in many areas that have special resource values or special protection, such as WAs, WSAs, cultural sites, special habitat. Buffer distances would be required between any future site and community and private land uses, such as schools, residences, cemeteries, and parks, that are considered incompatible or sensitive to coal mining. However, these minimal separations and the application of the unsuitability criteria would likely provide little attenuation of changes in visual context and character, noise, traffic, or dust to nearby locations from development of a new coal mine. Specific mine proposals would need to be environmentally assessed to address site-specific compatibility issues in the approval process.

Applications for sites for collecting home fuel are reviewed on a case-by-case basis. This would limit potential for permitting sites that are incompatible with surrounding uses.

### **Visual Resources**

The primary issue related to visual resources is the degree of visible change that may occur in characteristic landscapes, viewsheds, and areas with high scenic value. Project activities can introduce differing elements of form, line, color, and texture into the landscape. Direct impacts result from construction or placement of manmade features, such as roads, structures, equipment, or manipulation of vegetation. Indirect effects can result when actions change conditions that result in unsightly landscapes.

The degree of contrast and dominance of changes within the viewing area are the measure of change. Contrast also depends on viewing distance and the size of the features. Generally, the foreground refers to an area within a few yards to several hundred yards from the viewer, the middle-ground is several hundred yards to 5 miles from the viewer, and the background is generally beyond 5 miles from the viewer. In conjunction with the degree of contrast, the sensitivity or visual value of a location is considered when assessing overall impact to visual resources. Noticeable levels of visual modification in areas with lower visual value (VRM Classes III and IV) would produce less impact than the same degree of change in an area that has high visual value (VRM Classes I or II).

Several concerns were identified by BLM specialists and the community, particularly relative to the effects of energy development and OHV use on the visual quality of the surroundings. These are summarized below.

- It is generally perceived that the visibility of manmade features (roads, oil and gas wells, pipelines) in the landscape has increased significantly in the last few decades.
- Many unauthorized roads are created when vehicles (both recreational and industry) take short cuts and drive around barriers. These tracks are then used repeatedly until the path becomes an unofficial road. This adds to the

proliferation of roads and their visual impact.

- Visual scarring from OHV use is increasing, particularly around urban areas that are more accessible.
- Heavy trucks and vehicles operate on low-grade roads after rains and snow, and create large ruts that become gullies, widen the width of the original road, and create unsightly ground disturbance in the natural landscape.
- Well pad size and density contribute to a high degree of modification to the natural landscape. Well sites are located in prominent and visible locations, rather than sited to minimize their visibility from more traveled roadways and recreation spots.
- Follow-up and monitoring of reclamation activities (such as reseeding) is inconsistent, so these management prescriptions do not produce the intended natural restoration.
- Unreclaimed sites and discarded equipment add to the preponderance of manmade intrusions in the landscape.

Under all of the alternatives, construction of new well pads, pipelines and road segments, and associated clearing of vegetation have the greatest potential to alter visual conditions. Other major components associated with oil and gas development include water disposal well facilities, on-site water storage tanks, overhead power lines, and compressor stations.

Well pads and facilities are visually dominant in the foreground and greatly alter the immediate environs. Several conditions influence the visibility of new and existing elements, such as vegetative cover (type and density), terrain and line-of-site, and presence of other elements with visual dominance in the viewing area. When vegetative cover is low, new well pads and equipment would produce a moderate degree of contrast and change in the foreground. When vegetative cover is moderate to dense, clearing for new pads would introduce a high degree of change in the

foreground and moderate change on middle-ground views. Most oil and gas facilities and related infrastructure have relatively little visibility in distant landscape views and therefore have little impact from afar except where vegetation is dense or line-of-sight is uninterrupted.

Very little exploratory work is expected in the planning area because the mineral resource is well defined. Activities during construction generate short-term visual impacts such as dust, truck traffic, night time site lighting, and placement of heavy equipment. Longer term visual impacts result from clearing vegetation from about 5 acres for new well pads, pipelines, and road segments. (Part of this area is reseeded after initial construction.) The contrast created by vegetation removal depends on the type and density of the cover. Longer-term visual scars can also be created from some sites that require a large amount of cutting and filling that contrasts with surrounding landforms. Structural contrast is largely related to the distance from which components are observed. Under STCs, measures are taken to minimize visibility, such as aligning new road and pipeline with land contours, and painting equipment to blend with natural color tones. In general, during the production phase, well pad facilities become subordinate to the landscape in middle-ground view (between 0.25 and 1 mile) and noticeable but not dominant to a casual observer in background views (1 to 5 miles) (BLM 2000e). Other larger facilities, like major new pipeline corridors, longer road segments, compressor stations, or resource storage centers, may be visible in distant views.

During the abandonment phase, equipment is removed and disturbed surfaces are reclaimed with appropriate seed mixes. When sites are successfully restored to a natural condition, long-term improvement to the characteristic landscape results. Under each alternative, a projected level of reclamation would offset the impacts of new development. The net change is considered for each alternative below.

Because locations of specific well sites are not known, and impacts are most apparent in localized settings, the impact evaluations in this RMP/EIS are based generally on the projected percentage increase of oil and gas features in the landscape during the 20-year period of analysis. The potential for project activities to affect VRM Class I and II areas is noted within the FFO area. Because no new wells are projected within specially designated areas in the AFO, little or no impacts are expected to sensitive visual resources in the AFO area. Within the USFS land, there is strong precedent for enforcing visual management objectives. This is expected to continue and to minimize impacts on sensitive locations within the Jicarilla and Cuba Ranger Districts.

Within the planning area, the use of vehicles off roadways is another activity that causes visual changes. OHV activity can create pathways of disturbed vegetation, which form noticeable linear elements, and can also contribute to soil erosion and subsequent change or loss of vegetation. This kind of damaging activity appears unsightly to many viewers because of the associated environmental degradation. This disturbance

can be highly visible in areas where vegetation is removed, or in unvegetated landscapes where tracks can be highly noticeable. However, in some situations, dense vegetation can also hide (absorb) some of disturbance and make it less visible. OHV use has the most impact in the foreground and almost no visible impact in distance views. Generally, there needs to a high level of activity to result in “scarring” of the landscape. Such areas are mostly reported in the vicinity of the tri-cities area that are most accessible to greater numbers of recreationists. Some OHV travel is also reported around well pads, where heavy trucks can cause serious disturbance, particularly during wet weather.

Visual resources would continue to be managed according to prescriptions for specific SMAs; otherwise, VRM Class III and IV objectives would generally apply. **Table 4-9** lists the acreage in each VRM class under each alternative. Acreage includes both federal and non-federal lands, although VRM objectives would only apply directly to BLM land. Also, BLM would consider VRM classification of contiguous areas in defining COAs on APDs for federal minerals on non-federal land.

**Table 4-9. VRM Classes of FFO Lands under Each Alternative**

VRM Class	Acres <sup>1,2</sup>			
	Alternative A	Alternative B	Alternative C	Alternative D
VRM I	71,948	100,600	135,106	83,433
VRM II	399,466	409,960	590,479	560,143
VRM III	1,013,099	1,020,084	1,123,830	1,104,717
VRM IV	2,587,591	2,541,460	2,222,689	2,323,810
<b>Total<sup>3</sup></b>	<b>4,072,104</b>	<b>4,072,104</b>	<b>4,072,104</b>	<b>4,072,104</b>

Sources: BLM FFO, SAIC GIS data.

- Notes: (1) Specially designated areas with more than one VRM class were counted as the most restrictive class. Therefore, acres may overestimate the amount of land in Classes I and II.  
 (2) Includes federal and non-federal land in the FFO.  
 (3) Totals may not add up due to rounding.

### **Oil and Gas Leasing and Development**

The existing landscape in the high development area is interspersed with 18,000 wells and associated infrastructure, of which

about 14,400 wells are on federal minerals, and about 12,240 within the FFO area. The high oil and gas development area covers about 7,000 square miles with an average density of almost 2.6 wells per square mile. The average road

density in these areas is about 2 miles of roadway per square mile. By all accounts, development has become more noticeable over time as the number of wells has increased.

Under this alternative, 4,421 new wells are projected on land with federal minerals and about 300 miles of new roadway. This represents approximately a 2 percent increase in new roads and road density. Restoration of unproductive well sites to a natural condition is estimated to improve some areas. Therefore, little net change in the quality of the visual landscape is expected.

Within the high development area, there may be a slight increase in overall oil and gas development. This infill development would produce minor change in the degree of manmade modification over time, with minimal degrading of visual quality. If VRM objectives can be met, no adverse visual impact would result. Mitigations can be used to lessen impacts, such as siting wells away from canyon rims, using locations that are largely hidden by intervening landscape from most viewing locations, installing low profile tanks, and painting well pad equipment to blend with surroundings. In some circumstances, it is likely that VRM I objectives cannot be achieved, and impacts would result. The level of change may be acceptably low for one new well site, but each new site in VRM I areas would need to be evaluated on a case-by-case basis to account for other features in the area.

#### **Land Ownership Adjustments**

No additional lands are identified for disposal under this alternative. Impacts to visual resources can occur if future development of disposed land causes visual changes that are incompatible with adjacent management objectives of BLM lands. Acquisition of inholdings within specially designated areas could add higher protection of visual qualities through the application of VRM designations in some areas.

#### **OHV Use**

OHV use would continue to contribute to localized alterations, mostly around the tri-cities

area, further degrading areas with deteriorated visual value. Under this alternative, no change in VRM objectives is proposed and no actions would be undertaken to preserve these areas from further alteration. This would result in further decline in the visual quality of some locations around the tri-cities area. These would be noticeable from some roadways within the foreground and middle-ground viewing distance.

#### **Specially Designated Areas**

No changes in VRM prescriptions are identified under this alternative. As indicated in Table 4-9, about 88.7 percent of the FFO would be managed for VRM Classes III and IV standards and about 11.3 percent for VRM Classes I and II.

#### **Coal Leasing Suitability Assessment**

No new coal mines are currently proposed, but based on projections, new locations are likely to be developed over the next 20 years to replace projected declines at some mines in the San Juan Basin. Development is most likely to occur in the coal-rich belt extending from La Ventana on US 550, to Bisti on Highway 371 to Blanco Trading Post on US 550. Only areas that are identified as suitable (after applying the unsuitability criteria listed in Appendix C) would be considered. This area includes a high concentration of land with high visual and cultural resource value that is managed to preserve scenic quality. Development of a new surface coal mining operation would cause substantial changes to the visual environment in the immediate surrounding area. Surface disturbance within the Ah-shi-sle-pah WSA could have significant adverse impacts on visual quality of this area with exceptional scenic and wilderness value. Although areas outside Bisti/De-na-zin WA are not classified as VRM I, potential impacts of future coal mines to viewsheds that contribute to outstanding qualities of the WA would need to be evaluated. Visual context and viewsheds of several cultural sites, including Chacoan Roads, Pierre's Site ACEC, Chaco Culture Archaeological Protection sites, Chaco Culture



National Historic Park, and Traditional Cultural Properties would potentially be affected, and require assessment through further NEPA analysis that would be required for such an action in the future.

The impact on the landscape could be significant in localized areas around the mines. Depending on aspect, relation of highways to the new mining operations, and intervening terrain and vegetation, these alterations may affect a wider viewshed or expose a large number of viewers to highly degraded visual conditions. These issues would be further evaluated in a NEPA process prior to permitting of new coal mining. Approvals would need to consider sensitive visual resources in the permitting and review process, and mitigations would need to be developed for specific proposals to address any potential impacts on sensitive visual resources.

Overall, little change to visual conditions would result from oil and gas development under Alternative A. Some deterioration would continue from cross-country OHV use, particularly on easily accessible public lands in the tri-cities area, and major localized modifications could result from developing a new surface coal mine.

### **Cultural Resources**

Direct impacts to cultural resources would be caused by surface disturbance during construction and by driving over sites with OHVs. New construction has the potential to intersect and adversely affect archaeological sites and TCPs that previously have not been disturbed, especially in the areas with the highest density of sites and surface disturbance.

Indirect impacts to cultural resources would be related primarily to new road construction. The presence of new roads in areas previously inaccessible to vehicular traffic is likely to be accompanied by accelerated vandalism of archaeological sites situated near these new roads (Nickens et al. 1981).

Estimates of critical "distance from roads" at which archaeological sites are likely to be vandalized vary widely. Studies from Colorado

suggest that sites within 402 meters of roads are likely to be vandalized (Nickens et al. 1981), while studies from Utah indicate that sites within 741 meters of roads are most likely to be vandalized (Honeycutt and Fetterman 1985). Studies from Arizona indicate that sites within 600 meters of a road are likely to be vandalized (Ahlstrom et al. 1992). Considered together, prior studies indicate that archaeological sites within 400 to 800 meters of new roads would be subject to increased vandalism.

Due to mitigation measures required under continuing management regulations and policies, indirect impacts from vandalism resulting from the construction of new roads would be more likely to adversely affect cultural resources than direct impacts from new construction. The magnitude of impacts, both direct and indirect, would vary substantially among watersheds, depending on the number of wells to be constructed and the archaeological site density.

Archaeological site numbers and density vary considerably from one watershed to another. Site numbers and density were projected from the recorded site data in NM ARMS (2001). The estimated amount of new lands subject to initial surface disturbance varies from a low of almost 14,000 acres under Alternative A to almost 42,000 acres under Alternative B (Table 4-2). The number of archaeological sites likely to be affected in each watershed under each alternative was estimated using a weighted average of site densities for each watershed. The resulting weighted average site density in each watershed was then multiplied by the number of acres projected to be affected by each alternative. **Table 4-10** lists the number of archaeological sites potentially affected in the 19 watersheds under each alternative. These data should be used to interpret the relative effect of oil and gas development across watersheds, and from one alternative to another. The actual impacts on archaeological sites cannot be determined until site-specific locations of wells, roads, and pipelines are known.

Table 4-10. Projected Archaeological Sites Affected by Oil and Gas Activities by Watershed

Watershed	Alternative A	Alternative B	Alternative C	Alternative D
Animas	129	386	289	289
Arroyo Chico	0	0	0	0
Blanco	47	141	106	124
Carrizo	78	234	176	207
Chaco Wash	10	31	23	27
Chinle	0	0	0	0
Gobernador	41	123	92	108
Kutz Canyon	10	30	23	27
La Plata	60	178	134	157
Largo	128	384	288	338
Mancos	0	0	0	0
Middle San Juan	22	67	50	59
Navajo Reservoir	88	271	203	238
Pump Canyon	25	75	56	66
Rio Chama	1	0	0	0
Rio Puerco	0	0	0	0
Rio San Jose	0	0	0	0
Upper Puerco	0	0	0	0
Upper San Juan	97	291	218	256
<b>Total</b>	<b>736</b>	<b>2,211</b>	<b>1,658</b>	<b>1,896</b>

Source: NM ARMS 2001.

### **Oil and Gas Leasing and Development**

This alternative would have the least effect on cultural resources, with 736 archaeological sites projected to be within the areas of disturbance. In decreasing order of impact, recorded archaeological sites in the Animas, Largo, Upper San Juan, Carrizo, and La Plata watersheds would be most affected by this alternative (Table 4-10). In watersheds where the percentage of archaeological surveys is low, affected site quantity estimates may be underestimated.

The 358 miles of new roads (Table 4-3) constructed to serve oil and gas operations would provide greater public access to

archaeological sites and TCPs in the high development area. A potential impact from oil and gas development would be increased vandalism of archaeological sites and TCPs due to construction of new roads.

### **Land Ownership Adjustments**

The acquisition of non-federal land is proposed within 84 areas in the FFO that are designated to protect cultural resources. If these parcels are acquired, additional protection to significant sites would result.

### **OHV Use**

Because OHV access would be open in most of the FFO area under this alternative, there would be a high potential for

archaeological sites, especially those that are unrecorded or unprotected by closed and limited OHV designations within specially designated areas, to be damaged by vehicles driving across the landscape.

### **Specially Designated Areas**

Special protection from such surface disturbing uses as oil and gas activities, mineral entry, land disposal, vegetative disturbance, and OHV access would be provided to important cultural sites in 84 specially designated areas within approximately 40,400 acres in the FFO area. This would minimize impacts to the cultural resources within these protected areas.

### **Coal Leasing Suitability Assessment**

Site-specific cultural resources surveys and tribal consultation would be required before applications to mine coal for commercial or home fuel use would be approved. Any sites identified during these surveys would require avoidance or mitigation before mining could begin. Application of the unsuitability criteria would mitigate impacts to sites eligible for the National Historic Register. Cultural resources protected in the specially designated areas would not permit coal mining. Cultural resource clearance, and avoidance or mitigation, would be part of the permitting process when site-specific locations of proposed coal mines are known.

### **Paleontology**

Impacts to paleontological resources would be measured by physical damage to fossil-bearing formations through excavation or surface disturbance.

### **Oil and Gas Leasing and Development**

Alternative A would involve the least acreage of surface disturbance and have the least potential for impacts to paleontological resources due to the lower projected well numbers and the current management prescriptions within the 4 specially designated areas.

### **Land Ownership Adjustments**

There would be no impact on known paleontological resources because the resources would be surveyed prior to land transfers and important resources would be eliminated from disposal parcels.

### **OHV Use**

Cross-country travel has been documented by BLM staff to have damaged some geologic and paleontological resources. Repeated rock climbing and damage to slopes, soils, and vegetation could result in damage to paleontological formations through directly wearing down rock formations or causing accelerated erosion under Alternative A due to its open designation in most of the FFO.

### **Specially Designated Areas**

There would be no changes to the management prescriptions and boundaries of any of the specially designated areas specifically intended to protect paleontological resources under Alternative A. Not designating additional areas could adversely affect some paleontological resources by not providing protection of important formations known to occur outside existing specially designated areas.

### **Coal Leasing Suitability Assessment**

Coal mining would have the potential to affect these resources but, without site-specific information on the location of possible new mines, no impacts can be addressed. An inventory of paleontological resources would be required prior to mining, as well as documentation or collection of specimens uncovered during mining, in compliance with an agreement between the BLM and the State of New Mexico. This documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing them from their original context.

### **Recreation**

The primary concern for recreational resources is the potential for displacing or

significantly altering existing recreational opportunities. These changes could come about through land requirements and operations associated with fluid and non-fluid mineral development, changes in OHV use, and land adjustments.

Direct impacts would result if recreational areas and uses are displaced or excluded due to other activities. Indirect impacts would occur when other actions affect the visual quality, noise environment, cultural resources, or health of vegetation and wildlife that contribute to recreational experience.

The local community and BLM resource specialists have identified several issues related to recreation, listed below:

- Increased population and popularity of the area for outdoor recreation is placing new demands on recreational opportunities for a range of activities.
- Access brings people seeking different kinds of experiences into direct contact, often interfering with differing recreational objectives. For example, motorized vehicles can cause noise that interferes with hunting, hiking, and back country camping. Motorized vehicles cause widening and damage to trails that is detrimental and unsafe for mountain bikers and horse riding. There are disagreements among different recreational users about the need for segregating trails for particular uses.
- Noise from oil and gas compressors is affecting the quiet environments that are desirable in many dispersed recreational activities.
- Noise from OHVs and other motorized recreational vehicles is disturbing other recreationists and residents adjacent to popular OHV sites.
- Some people feel strongly that the public lands are extensive, there is ample room for everyone, and therefore the land should be widely accessible for all uses.

- BLM provides very little surveillance and on-site monitoring at recreation sites, and vandalism, particularly at popular recreation sites close to the tri-cities area, is increasing and difficult to manage. Common acts of vandalism include destruction of oil and gas equipment, theft or destruction of signs, graffiti, and littering.
- Road closures impede access for hunting and other recreational use. On the other hand, some OHV users are ignoring barriers and entering areas that are private or closed for resource protection purposes.
- Shooting is allowed in some areas but can be unsafe and unnerving for other recreationists, and can occur in areas that are not designated for this activity. Safety is becoming a greater concern as the numbers of people and mix of recreation activities increase.
- Livestock are sometimes harassed by motorized recreationists.
- OHV use is causing visual scarring of some sensitive landscapes.
- Because of the current open OHV designation for most of the FFO area, some users assume that all areas are open to OHVs. People are unsure where restrictions apply.

**Table 4-11** summarizes existing and projected oil and gas activity in the recreation areas under each alternative.

**Table 4-12** indicates the number of acres that would fall within ROS classes under each alternative.

**Table 4-13** presents recreational SMAs under each alternative.

**Table 4-11. Oil and Gas Activity in Recreation Areas in the FFO Area under Each Alternative**

Recreation Area Condition	Alternative A	Alternative B	Alternative C	Alternative D
Existing wells in Recreation Areas	430	409	561	561
New wells in Recreation Areas	176	427	360	360
Acres in Recreation Areas <sup>1</sup>	52,804	51,881	75,174	75,174
Well density change (percent)	41%	105%	63%	63%
Area displaced in Recreation Areas (percent) <sup>2</sup>	<1%	2.4%	1.4%	1.4%

Notes: (1) Applies to BLM land only.

(2) Not accounting for wells that go out of production.

**Table 4-12. ROS Classifications in the FFO Area under Each Alternative**

ROS Class	Acres <sup>1</sup>			
	Alternative A	Alternative B	Alternative C	Alternative D
Rural	0	19,388	27,502	19,388
Roaded Natural	8,946	15,452	39,435	39,431
Semi-primitive non-motorized/motorized <sup>2</sup>	5,275	6,636	5,275	5,275
Semi-primitive non-motorized	49,462	54,617	55,978	55,978
Primitive	0	0	0	0
<b>Total</b>	<b>63,683</b>	<b>96,093</b>	<b>128,190</b>	<b>120,072</b>

Notes: (1) Applies to BLM land only.

(2) Motorized uses generally apply to mesa top areas. Canyon sides and bottoms would be non-motorized.

**Table 4-13. Areas Managed for Recreational Values in the FFO Area under Each Alternative**

In Recreation Areas	Acres <sup>1</sup>			
	Alternative A	Alternative B	Alternative C	Alternative D
Acres managed for recreation	52,804	51,881	75,174	75,174
Percent change in Recreation Area	N/A	-1.7%	+42.4%	+42.4%
Percent of FFO <sup>1,2</sup>	3.7%	3.7%	5.3%	5.3%

Notes: (1) Applies to BLM land only.

(2) Not accounting for future land adjustments.

Under this alternative, several of the ongoing issues and conflicts in managing recreational resources would continue. In addition, there could be an increase in the number of oil and gas facilities dispersed throughout the high development area over the

next 20 years that could directly and indirectly affect recreation.

### **Oil and Gas Leasing and Development**

About 4,421 new oil and gas wells could be developed on federal land in the FFO in the next 20 years, and about 2,390 on new sites.

Accounting for newly disturbed and restored areas, a small amount of land in the high development area (about 900 acres) would become unavailable for multiple use. This should have little effect on the availability of dispersed recreation throughout the FFO area. Potential changes in visual quality, road density, noise levels, and overall human activity would be insignificant.

Current constraints on oil and gas development and the extent of areas specially managed for recreational values (about 53,000 acres, or 3.7 percent of FFO land) would remain in effect. There are currently about 430 wells within the 8 SMAs managed for recreational values, with about 396 new wells projected over the next 20 years. The average well density in these areas could increase by about 40 percent. This does not account for wells that may be reclaimed because it is not known where these would be located. Recreation would be displaced by new well facilities on less than 1 percent of these areas.

About half the new wells would have small compressors that generate noise. Under this alternative, there may be 300 new noise sources in recreation areas throughout the FFO. About 133 large compressors (between 500 and 10,000 HP) and up to 9,710 small compressors (100 HP) scattered throughout federal land in the oil and gas fields would also generate noise at new sites. Overall, this would cause localized changes in the noise environment throughout the FFO area near compressors. This could have widespread effects on the quality of dispersed recreation. Because of existing stipulations and protective laws, the WA and WSAs would be relatively unaffected by oil and gas operations, and noise from motorized vehicle use. Along the periphery of these areas, there may be indirect effects from noise sources on adjacent lands.

There would be about 440 new wells on AFO land under Alternative A. None are projected within WSAs or SMAs where recreation would be an emphasized value because these areas are generally outside the highly productive oil and gas fields.

Consequently, minimal impact is expected to recreation in the AFO area.

Under Alternative A, the areas immediately around Navajo Lake and along the San Juan River would continue to be restricted by NSO constraints, with CSU stipulations for oil and gas development applying elsewhere on USBR land. Over the next 20 years, there could be 110 projected new wells on USBR land. Assuming some reclamation, there should be no net loss or gain of land for multiple uses. Controlled surface use stipulations and VRM II classification allow for more careful siting of new wells, minimizing potential conflicts with recreation areas. Noise from existing well compressors and its effect on quality recreation has been a concern. A small number of new noise sources should have minimal overall impact, which could be lessened through site modifications. New wells would be sited as much as possible to avoid lakeside and rim locations that are easily visible from the lake or campsite areas.

About 230 new wells are projected for the USFS lands, primarily in the Jicarilla Ranger District, and about half may have small compressors. New development would increase traffic on some forest roads and introduce new noise sources where people undertake dispersed recreational activities throughout the District. APDs would include actions to minimize impacts on visual objectives and consider siting relative to designated recreation areas. This would tend to lessen some impacts on recreation in USFS areas. It is unlikely that fewer people would recreate in these areas, but they would be likely to choose locations, when possible, away from intrusive manmade features. Clearing land can be more obvious in woodland areas, but forest and relief provide some screening of oil and gas facilities. Winter closure to exploration and well development would continue to prevent undesirable conditions for wildlife and recreationists from November to April, particularly hunters. The public would be able to purchase the trees cleared for new oil and gas roads, but the new roads would be gated and not provide general

access to the public. Continuing to review new well sites carefully and requiring clearance for resources of concern (including recreation sites) would lessen the potential for direct impacts on developed recreation.

Overall, changes in visitation levels at developed recreation sites are difficult to predict, but visitor satisfaction would be likely to decline if scenic and acoustic quality declines as a result of oil and gas development. Under this alternative, little overall change in visitor satisfaction is expected as a result of low numbers of projected oil and gas development.

#### **Land Ownership Adjustments**

Under Alternative A, land disposal would be emphasized, particularly as exchanges with other federal or state entities. If BLM disposed of land in the tri-cities area that is popular for recreation activities (for example, biking areas along the rim of Crouch Mesa), and it was developed for some other use, this loss of resource would be detrimental. To avoid this, applications under the R&PP Act would continue to be reviewed and evaluated for consistency with BLM policy. Actions to dispose of BLM lands that could affect special recreation areas or other areas that have become popular for unofficial OHV travel and mountain biking use would be favored if they incorporate these uses in a publicly beneficial manner after disposal. Areas south of US 550 that are available for transfer or exchange tend to have fewer special values for recreation, although some dispersed activities occur throughout the FFO. Disposal of these areas would have little impact on recreation. Acquisition of inholdings in recreation SMAs would improve management and access for recreation.

#### **OHV Use**

Under this alternative, the majority of BLM land in the FFO area would remain open to off-road use. Some users who enjoy unconstrained access see this as beneficial. However, the potentially incompatible mix of motorized and un-motorized uses would continue in open areas. Also, the potential for noise and dust

from widespread cross-country travel to affect private land owners would continue. With population increases and the burgeoning reputation of this area for vehicular recreation, over the next 20 years there would likely be more off-road activity, particularly near urbanized areas. Indirect effects could reduce the quality of hunting opportunities and the natural qualities that are a component of outdoor recreationists' enjoyment.

Management plans for OHV use would be pursued in 13 areas identified in the 1996 OHV amendment. The assumption is that these areas would be classified as "limited" to maintained roads and designated trails, and this expectation has been accounted for under continuing management guidance. Much of the land in these areas is popular for hunting and outdoor recreation. Given the extensive network of maintained roads throughout the FFO and particularly the oil and gas areas, access should remain high. Some road closures for protecting specific resources have limited motorized access to favored hunting areas and could continue in the future. Even if all 13 OHV management units limited motorized access, over 60 percent of the FFO area would be open to cross-country travel.

#### **Specially Designated Areas**

There would be no change in specially designated areas or their prescriptions under this alternative. ROS classifications (Table 4-12) would remain the same. An updated inventory of roads in the FFO is needed in order to apply the ROS as a management tool to improve the recreational experience.

#### **Coal Leasing Suitability Assessment**

No additional (new) development of coal resources has been specifically located under this alternative within the FFO. The area with the highest potential for coal mining has no specially designated recreation areas. Development would not be permitted in the WA where the recreational experience has special value. There would be no development in the WSA until a Congressional decision is made and/or the PRLAs adjudicated. If

adjudication favors the PRLAs, development of coal mines in the WSA would have localized impacts on land that has high intrinsic value for remote recreation opportunities. The value of some special cultural sites and fossil deposits in the area that are popular for public visitation could be affected indirectly if a new surface mine were developed nearby (see Visual Resources).

## **Noise**

### **Oil and Gas Leasing and Development**

The major cause of noise impacts would be the increased number of wellhead compressors associated primarily with gas operations. According to the RFDS (Engler et al. 2001), small compressors of approximately 100 HP are expected to increase to be associated with approximately half the number of new and existing wells in the planning area. With a projected 4,421 new wells projected under Alternative A, and 14,400 existing wells on federal minerals, this could result in 9,410 small compressors scattered throughout the high development area on land with federal minerals. Noise from the small wellhead compressors caused by mechanical parts and exhaust range from 91 to 107 dBA at the source when operating at 100 percent load (Wagner Power Systems 2002).

In addition to the small wellhead compressors, it is estimated that 9 large compressors (2000 to 10,000 HP) and 133 mid-size compressors (500 to 2,000 HP) would be installed under Alternative A. Noise from these compressors, assuming that they are gas-fired, would range from 44 to 69 dBA at a distance of 500 feet and 89 dBA to a distance of 50 feet from the source.

Actual noise impacts from gas operations would be highly variable, depending on the type of compressor and muffler, location, distribution, and terrain of the compressor stations and well pads. Noise impacts would be mitigated near identified golden eagle, ferruginous hawks, and prairie falcon nests in compliance with the FFO raptor noise policy.

Individually, the noise generated by the small compressors may be an annoyance for residents or visitors to the planning area. Also, a significant impact on the human environment could result from the combined noise of many compressors of different sizes in an area. Noise impacts under this alternative would increase as new wells and compressors are added and would be mitigated on a case-by-case basis.

### **Land Ownership Adjustments**

If public land becomes non-federal land through disposal or exchange, increasing the non-federal landowners and land users in the high development area, it is possible that there would be additional conflicts over noise, if more people live or recreate in areas interspersed with gas wells.

### **OHV Use**

Noise from OHV use would be most prevalent in the FFO area under Alternative A because access would have the fewest restrictions. OHV noise would be short-term, however, with insignificant long-term impacts.

### **Social and Economic Conditions**

The primary socioeconomic issues associated with implementing the alternatives arise from potential changes in jobs and income, spending in the local economy, and changes in revenues in the form of royalties and taxes and disbursements to local governments. The following analysis focuses on development of oil and gas resources on federal lands as the primary action that could effect measurable change in the above categories. Of concern to the oil and gas industry, in terms of viability, is balancing production costs with value of the product.

Direct effects include changes in employment and income for oil and gas workers, expenditures in the local and regional economy for constructing new wells and infrastructure, changes in productive value and production payments (such as royalties), and changes in taxes and disbursements to state and local government. The estimation of direct expenditures for new well construction provides



a comparison of the relative cost of alternate drilling technologies for each alternative.

Indirect effects are measurements of induced economic activity brought about by direct effects. This analysis addresses indirect jobs and expenditures that may be generated, based on multipliers from equivalent analyses.

Cumulative impacts from changes in other productive uses on federal and non-federal lands may also result. This analysis generally considers changes in coal production and grazing operations in the FFO area. Under all alternatives, projections for coal production in the San Juan Basin are relatively stable with a slight reduction in annual production over the next 20 years. Specific mines are expected to close in the FFO (McKinley and La Plata) but new mines are likely to open. This would be largely market-driven, with the underlying premise that the region's power plants will continue to operate and generate demand. Also, that given current infrastructure, certain plants need coal supplied from nearby sources. Overall, coal jobs are expected to stay about at current levels, although there may be some fluctuations and possible declines up to 8 percent (about 100 jobs) over 20 year period. Also, the location of any future operations may be more (or less) favorable for workers in some locations in respect to driving distances to work or the need to relocate. The relative contribution from the coal industry compared to oil and gas would remain small but important as a stabilizing component.

**Table 4-14** compares the impact of the alternatives on employment. The job numbers are based on the average number of employees expected per well site per year for maintenance and development functions (BLM 2000d,e). They include both direct jobs (those described above), and indirect and induced jobs. These are jobs that are generated to support oil and gas field functions (such as suppliers of well equipment), and jobs that are generated as a

result of earnings and spending from oil and gas industry jobs. For example, there may be demand for additional services or economic activity that stimulates jobs across several industrial sectors (i.e., retail and wholesale trade, services, real estate and banking, etc.). It is expected that most jobs would be local (in San Juan and Rio Arriba Counties) and primarily in the tri-cities area. These estimates represent average projected jobs. They do not take into account variabilities in market demand and responding fluctuations in production and employment that are characteristic of the industry. Under all alternatives, boom-bust cycles are likely to continue. Assuming that about 80 percent of wells are on federal land, total employment in the San Juan Basin associated with oil and gas industry would be about 20 percent higher than the levels shown in the table.

**Table 4-15** compares expenditures across the alternatives. These account for costs associated with development of new wells, and maintenance of existing and new wells in the planning area. A recent technical report on the Economics of Alternative Drilling Technology (available from the FFO) estimates the average drilling cost per well by alternative. Other average functional costs and multipliers were also used to calculate the total direct and indirect expenditures for projected oil and gas operations (BLM 2000d,e). These values represent a comparative baseline and may not include all expenditures over the next 20 years.

When compared to overall employment, earnings, and revenues in the planning area, the effects of the alternatives are not anticipated to result in measurable changes in demographics, economic activity, public infrastructure and services, or local government services of the region.

**Table 4-14. Average Annual Oil and Gas Employment for Federal Minerals in the Planning Area**

	Employment			
	Alternative A	Alternative B	Alternative C	Alternative D
Current Oil and Gas Employment				
Average annual development jobs <sup>1</sup>	860			
Estimated current maintenance oil and gas jobs	6,870			
Total estimated current oil and gas jobs <sup>2</sup>	7,730			
Projected New Employment				
New development jobs	7,760	20,370	15,590	15,730
Average year development jobs <sup>3</sup>	390	1,020	780	790
New maintenance jobs (20 <sup>th</sup> year) <sup>4</sup>	-740	1,300	580	610
Total oil and gas jobs (20 <sup>th</sup> year) <sup>5</sup>	6,520	9,190	8,230	8,270
Change from current levels	-1,210	1,460	500	540
Existing employment in planning area	124,851	124,851	124,851	124,851
Percent change in regional employment (%)	-1%	+1%	+0.3%	+0.4%
Change from current oil and gas employment (%)	-16%	+20%	+6%	+7%

Source: BLM 2000d,e.

Notes: (1) Jobs for development of new wells and infrastructure have varied over the last 10 years. The estimates in this table are based on recent years (2000 and 2001). These years represent higher levels of development (and therefore more jobs) than was typical in the last 10 years. The estimates are derived from numbers of employee days for specific development and maintenance functions, and multipliers that account for indirect and induced jobs generated by expenditures by the oil and gas industry (BLM 2000d,e).

(2) Oil and gas jobs associated with development on non-federal land would increase these totals by about 20 percent.

(3) Based on an assumed 20-year buildout of projected wells.

(4) For maintaining new wells. Negative values reflect loss of maintenance jobs when the overall number of new wells is less than those that go out of production.

(5) Includes maintenance of existing wells and new wells (accounting for decommissioned wells) and new development jobs.

**Table 4-15. Expenditures for Oil and Gas Development for Federal Minerals in the Planning Area**

	(\$000)			
	Alternative A	Alternative B	Alternative C	Alternative D
Cost per new well (drilling)	551	541	535	536
New wells (drilling)	2,436,000	7,182,000	5,262,000	5,329,000
New compressors	95,625	360,000	360,000	360,000
New pipeline	162,000 <sup>2</sup>	540,000	540,000	540,000
Total direct costs	2,694,000	8,082,000	6,162,000	6,229,000
Indirect expenditures (1.28 multiplier <sup>1</sup> )	754,200	2,263,000	1,725,000	1,744,000
Total expenditures over 20 years	3,448,200	10,345,000	7,887,000	7,973,000
Per year average expenditure <sup>2</sup>	172,410	517,250	394,370	398,660

Sources: BLM 2000e,f; SAIC 2002d.

Notes: (1) Multiplier from BLM 2000e.

(2) Does not include cost for new oil and gas roads.

Recreation and tourism are becoming increasingly important to the economy of the planning area. Various forms of outdoor recreation are popular, and they sometimes come in conflict with one another. Increased oil and gas development could have a negative impact on some types of recreation. Because there is no data on current levels of public use of FFO lands for recreation, it is not possible to estimate relative changes in recreational use and associated economic activity, except qualitatively. Changes in the visual landscape, cross-country access, and increased noise can affect the recreational qualities for some users and visitors. However, increased population and current trends in outdoor recreational activities suggest that this industry will not decline over the next 20 years. Also, the FFO is actively promoting and managing for popular vehicular sports (both motorized and unmotorized). These activities should overall provide for stable economic contributions from recreation and related tourism in the region.

### **Employment**

Under this alternative, based on a total of about 220 new wells and reclamation of 211 wells per year on average over the next 20 years, there would be a loss in development jobs of about 400 to 500 jobs per year in the planning area. This is based on current levels of development in the planning area. There would be a loss of maintenance jobs over 20 years (740 fewer by the twentieth year), resulting in an overall average decline in oil and gas employment on federal land of about 16 percent in the long-term. Short-term changes would be minimal. This would have a moderate impact on oil and gas industry employment in the planning area, but minimal impact overall for the region.

Employment in the coal industry may fluctuate due to production both on federal and non-federal land. Some mines are forecast to decline in production, notably La Plata and McKinley on FFO land. However, the San Juan Underground mine should increase production, offsetting losses in jobs basin-wide. In response

to market demands and resource potential, new mines may open. These are most likely to be located on the competitive coal lease tracts or within the Coal Belt SMA where most of the resource is located. However, other areas both on federal or non-federal land could be developed if found to be viable. Specific proposals would undergo permitting and environmental review. Overall, 20-year production for the San Juan Basin is estimated to peak in the next year or so and decline slightly but remain stable thereafter (Hill and Associates 2000). Associated jobs are likely to reflect the same pattern, with some potential fluctuations and change in the location of jobs.

Displacement of grazing due to resource development or other FFO actions would be small and have little effect on jobs.

### **Development Expenditures**

An analysis of well development costs found that under Alternative A, the cost for drilling 4,421 wells is estimated at just over \$2.4 billion, at an average cost of about \$551,000 per well (SAIC 2002d). The average well cost for this alternative was the most expensive among all the alternatives. This affects industry by increasing production cost and lowering profit margins. Additional direct costs for roads, pipelines, compressors and equipment would increase the total investment to about \$2.7 billion. Additional indirect expenditures could result in a total of just over \$3.4 billion spent over 20 years, an average of \$172.4 million per year (non-escalated). This represents a considerable decline in expenditures and rate of development over current levels but within the range experienced over the last 10 years. If current levels were projected into the future at the same cost per well as projected for this alternative, it is expected that average expenditures would be about \$446 million per year. Alternative A would fall short of current development expenditures by almost 260 percent.

Development of new mining facilities could generate expenditures in the local economy for goods and services. When specific proposals

are identified the impact on the local economy would be further assessed. Individual proposals would be assessed. These would generally have positive impacts on the local economy.

### Revenues

Under Alternative A, the projected volume of oil and gas production on federal land over the next 20 years is estimated at 4,910 billion cubic feet (Bcf). (Calculations are based on gas values, because oil accounts for a very small portion of the fluid mineral product in the planning area.) Assuming a value of \$3.00 per Mcf (NMDFA 2001), the total value of this product could be about \$15 billion (in 2001 dollars). Additional production on non-federal land could increase this value by about 30 percent.

It is difficult to predict royalties and taxes for any given year in the future because some existing wells would go out of production and new wells added each year. Also, the variability of gas prices could considerably alter the taxable base value. Under this alternative, there would be a slight increase in production potential over the next 20 years over the existing levels, based on new well development and projected well abandonment. With New Mexico deriving between 10 and 20 percent of its general funds from energy resources, this would provide a stable tax revenue base over the long term. However, it should be noted that although this alternative would result in a small and gradual increase in production potential over current levels over the long-term, production potential would not grow as rapidly as it would if the current day rate of new development were sustained.

In addition to oil and gas taxes, there would also be continuing taxes on other minerals (primarily coal in the planning area). Under this alternative, future development of competitive coal tracts or suitable lands in PRLAs in the FFO is possible. Based on assessments by Hill and Associates (2000), several options could meet the demands of the San Juan power plant. The nearby La Plata competitive lease tracts could be developed in addition to

ongoing expansion of the San Juan Underground mine. San Juan could also be supplied by a possible expansion of the Navajo mine (not on FFO land). Development of additional Lee Ranch tracts could make up for projected declines of Lee Ranch mine, but this coal would continue to go to out-of-state customers. Production of federal minerals would continue to provide royalty revenues over the planning period. Royalties may decline slightly as projected production of the La Plata, McKinley, and Lee Ranch mines decline (Hill and Associates 2000).

Under all alternatives, future tax and royalty revenues will depend on market value, production volume, location, and owner of the produced energy mineral resources. Also, tax policies and assessed rates will continue to determine the total revenue value. Each of these variables can greatly influence future revenues to the state and local jurisdictions.

Ongoing PILTs paid to local governments would remain essentially unchanged. These represent a relatively minor source of revenues for the four counties in the planning area.

### Environmental Justice

Each of the counties in the planning area has a high proportion of minority populations compared to the state and nation as a whole. McKinley and San Juan County have a distinctly high percentage of American Indians, while Rio Arriba has a large Hispanic population, and all but Sandoval County have higher levels of low-income populations. Four Indian reservations either overlap or are adjacent to the planning area. Consequently, the potential exists for minority and low-income populations to be affected by the alternatives under consideration in this RMP/EIS.

Specific issues of concern for this analysis include:

- Potential for economic impacts (such as job losses or increases).
- Potential for land use impacts (such as noise impacts from compressors, or displacement of communities or existing

uses where minority or low-income persons reside or work).

- Potential for conditions that pose a public health or safety risk (such as those that deteriorate air quality or release hazardous materials).

Concern has been expressed about royalty payments for federal mineral resources on Indian lands. Resolution of this legal issue is beyond the scope of this EIS.

Because of the broad scale of this EIS, it is not possible to determine the location of projected new oil and gas development and, therefore, potential impacts on specific communities or residents are not predictable. Any potential impacts, such as noise from compressors, or placement of large equipment that is incompatible with residential uses, would be addressed in site-specific APDs. Similarly, avoidance of specific resources, such as sensitive plant species or cultural sites, would be implemented at the site-specific level.

Most activities taking place on federal land in the San Juan Basin occur without influence of demographic or income values, but rather, in response to various resource values. In general, resource production and protection is balanced for overall public benefit. Specific activities may take place in locations that affect specific local populations or individuals that may be disproportionately minority or low-income in composition. This is particularly likely for Rio Arriba and McKinley counties that have high percentages of the population in both these categories. Change in energy resource production has the greatest potential to affect these counties that derive tax revenues from these industries and where jobs are particularly needed (Table 3-24, Table 3-30).

Under Alternative A, there may be minor job losses in energy related jobs. However, new coal mines, not yet identified, may benefit some communities more than other by providing jobs. Increased employment opportunities are generally evaluated as positive impacts for the area, and could benefit areas where the labor

pool is comprised of minority and low-income population. Localized impacts from siting of future wells or mines may affect communities or isolated residences. Given the population characteristics, these may be impacts to persons of minority and/or low-income status. However, site selection per se, is driven by resource value, development costs, and ownership issues. Future applications and approvals would be subject to environmental review. Approvals would consider necessary mitigation to reduce specific incompatibilities between proposed development and any sensitive human activities.

Some displacement of multiple uses on federal land from new well facilities and changes in stipulations and management prescriptions would slightly reduce the availability or quality of some resources for the public at large. Potentially affected resources include recreation, grazing, wood gathering, access, cultural sites, mineral entry and leasing, and visual qualities. These impacts would generally occur away from population centers and would not directly affect particular populations.

The positive effects of additional jobs and economic activity in the region from oil and gas development have the potential to benefit all residents. Under Alternative A, some loss of jobs and economic activity in the oil and gas industry could have minor negative effects. It is not possible to identify specific jobs or businesses that would be affected. Oil and gas development on non-federal land, including Indian lands, is not projected to decline.

Land disposal actions proposed for the tri-cities area could increase the supply of land available for urban development. This could offset trends for rising land prices as buildable and serviceable land is depleted. Indirectly, this could benefit low-income persons by preserving a supply of affordable housing.

## **ALTERNATIVE B – RESOURCE PRODUCTION**

### **Surface Disturbance Due to Oil and Gas Development**

The assumptions and methods used to determine impacts are described under Alternative A. The amount of long-term surface disturbance associated with well construction would be 24,781 acres for Alternative B. This does not include plugged and abandoned wells already awaiting approval for reclamation. Surface disturbance associated with large pipelines is assumed to be 11,716 acres. Approximately 1,700 acres of disturbance would be associated with the installation of 20 Phase 1 compressors and 300 Phase 2 compressors (Table 4-1). There would be an additional 13,800 acres of initial short-term surface disturbance that would be revegetated after construction.

### **Watersheds**

Under Alternative B, short-term surface disturbance is estimated to total approximately 42,000 acres due to construction of new wells, roads, and small pipelines. As under Alternative A, it was assumed that the majority of the earthmoving for large pipelines and compressors would be located in the high development area in the northern part of the planning area. The largest anticipated acreage of surface disturbance would occur in the same watersheds most affected under Alternative A: Upper San Juan, Largo, Navajo Reservoir, Carrizo, Animas, La Plata, Blanco, Gobernador, Pump Canyon, Middle San Juan, and Kutz Canyon, in descending order (Table 4-2).

Under this alternative, there would be an increase ranging from 30 to 232 miles of new roads in 11 of the 19 watersheds, resulting in an increase in unpaved roads ranging between 2 and 18 percent in those watersheds. The total increase would be approximately 1,075 miles in the high development area (Table 4-3). This would result in a potential increase in sediment yield due to the additional acreage of bare soil

and miles of unpaved roads, with the largest increases anticipated in the same watersheds that would have the highest surface disturbance from new well locations and pipelines.

Most of the soils in the watersheds with the majority of the predicted surface disturbance and new road construction are moderately to highly erodible due to rainfall and surface water runoff. Most of these watersheds are in the low to moderate category for wind erosion. It is likely that significant erosion and sedimentation would be caused by increased initial surface disturbance, which would be reduced when well pads, roads, and pipelines are stabilized by seeding and the establishment of surface water controls.

### **Geology and Minerals**

#### **Oil and Gas Leasing and Development**

Implementation of Alternative B would allow access to hydrocarbon reserves without the need to commingle production or use dual completions. The number of completions allowed under this alternative would be 13,275 on federal minerals after consideration of surface constraints that would limit access to 17 wells. Each completion would produce from a single well bore. NSO restrictions would require 84 directional wells (0.6 percent of all wells) to be drilled to access reservoirs under specially designated areas and Navajo Reservoir. There would be 28,273 acres closed to new leasing in the planning area.

Because small quarries of less than 5 acres are frequently excavated to supply sandstone and gravel for stabilizing roads to oil and gas wells, it is anticipated that, as the number of new well pads increase, so would the number of quarries in the high development area. Therefore, the largest number of quarries would be constructed under Alternative B. These small quarries would be approved with APDs or through other BLM permitting procedures, and would be located in areas that avoid impacts to natural and cultural resources.

### **Land Ownership Adjustments**

Under Alternative B, 347,505 acres of public land would be available for disposal, of which approximately 265,000 acres contain federal minerals, mostly located in the areas identified as suitable for coal mining and in the vicinity of the tri-cities area. If this land leaves federal ownership, there would be a potential for complications in extracting these minerals because coordination between the non-federal landowner and the federal mineral manager would be required. Land disposal transactions would be required to consider impacts to the 6 salable mineral areas, resulting in fewer conflicts and limits to these important deposits through improved planning and coordination.

The potential for conflicts between competing users of the land in the vicinity of the 6 salable mineral areas delineated in Map 2-5 would be less than under Alternative A because access to these areas would be preserved to the extent possible by FFO resource managers.

### **Specially Designated Areas**

The primary effect on oil and gas development from the designation of special areas would be the limitations imposed on how the surface resources would be managed within their boundaries in the FFO. Due to NSO constraints within specially designated areas in the FFO, there would be 1 well that would not be developed and approximately 26 wells that could be developed if directional drilling were used.

Locatable minerals would not be affected by oil and gas development, but would be withdrawn or closed in most of the specially designated areas. There would be little impact on the extraction of locatable minerals, however, because most of the limitations on mineral leasing would be in specially designated areas that are not in the vicinity of the locatable minerals in the planning area.

### **Coal Leasing Suitability Assessment**

There would be more potential conflicts for mineral extraction, especially in the coalbed

methane-producing formations, under this alternative because the total number of oil and gas well sites approved over the next 20 years would be the highest of all the alternatives. The areas identified as suitable for coal mining development after application of most of the unsuitability criteria (378,875 acres) are outside the high development oil and gas area, but conflicts would still have the potential to arise in the Fruitland Formation. The Additional Coal Interests shown on Map 2-8 are south and west of the high development area, so fewer conflicts would be anticipated.

### **Soils**

#### **Oil and Gas Leasing and Development**

Due to the higher numbers of projected new well locations, roads, and pipelines, this alternative would have the greatest short-term and long-term impacts on soils from oil and gas activity. Initial short-term surface disturbance from construction of new wells, pipelines, and roads would be approximately 41,900 acres, with 13,800 acres revegetated after construction (Table 4-2). When accounting for the reclamation of P&A wells and roads, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be almost 24,800 additional acres (Table 4-1). The resulting impacts to soils would be a potential increase in soil erosion due to the increase in bare ground and unpaved roads.

There is the potential for more impacts to prime farmlands due to construction associated with oil and gas development than under Alternative A because the watersheds with the most prime farmland soils are within the high development area, and more wells would be completed.

### **OHV Use**

Limited OHV access over most of the FFO area would result in less potential for damage to vegetation and soil crusts, and thereby less potential for sheet, rill, and gully erosion through enforcement of OHV designations. Increased soil erosion would be expected to

result where OHVs are permitted to ride on existing trails because they would increase soil compaction and further reduce existing vegetative cover while preventing its reestablishment. Adding the acreage listed as potentially suitable for open OHV designation listed in Table 2-10 would not result in significant soil impacts because the highly erodible soils and those topographic features with the most fragile biological crusts would be eliminated from consideration. Site-specific evaluations of potential soil impacts would be conducted before final open designations are made.

### **Coal Leasing Suitability Assessment**

Impacts to soils have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Additional Coal Interest areas. A majority of the potential coal mine areas are located within the Chaco Wash watershed, which would have the greatest chance of being affected if additional coal mining were approved. The majority of this watershed is moderately susceptible to water erosion and high salinity, and has low susceptibility to wind erosion, all of which would be accelerated if additional coal mining were started.

Inclusion of BMPs in future coal leases to reduce surface water runoff and erosion would be required to meet state and federal regulations and would minimize accelerated erosion. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species are preferred but not required under this alternative. Site-specific impacts on soils from new coal leasing would be evaluated in project-specific EAs before issuance of the leases by the BLM.

### **Water Resources**

#### **Oil and Gas Leasing and Development**

Under Alternative B, new oil and gas development would result in a net increase in long-term surface disturbance of almost 24,800

acres (Table 2-1). Water required for the drilling operations would amount to over 9,580 acre-feet, assuming 5,600 barrels per well would be needed.

In general, potential long-term impacts to surface water resources would result from an increase in sedimentation and salt yields due to a greater area of surface disturbance than under Alternative A. Peak runoff rates would increase due to removal of vegetation and compaction of soils on new roads and well pads, but the impacts would depend on the location of the new facilities in each watershed and their distance from drainages, rivers, and other water bodies.

There would be an increase in short-term impacts to water resources as a result of sedimentation from the increased acreage of short-term surface disturbance during construction. Potential impacts to groundwater could result from infiltration in unlined pits or spills from oil and gas operations. The short- and long-term impacts to surface water and groundwater would be minimized through the use of BMPs and pollution prevention measures as required by federal and state regulations.

### **Land Ownership Adjustments**

Modification of BLM land ownership would not directly impact water resources. Depending on the modifications implemented, indirect impacts to water resources could result if land management changes due to land transfers. The larger disposal area in the vicinity of the tri-cities area that would be considered for development could result in an increase in water use in the region, if the land were to be developed for public use.

Potential uses of any land that would be transferred under Alternative B are currently unknown. Therefore, it is not possible to analyze impacts to water resources. When these uses are proposed in the future, subsequent NEPA analysis would be required to determine the specific impacts.



**OHV Use**

Because the acreage of open designations for OHVs would be greatly reduced under Alternative B, potential impacts to water resources would be less than under Alternative A. Localized impacts to water resources would continue to occur on lands where cross-country travel is permitted and in the bottoms of washes.

**Specially Designated Areas**

Depending on the location of the area, there is a potential to positively affect water resources through improved land management practices and greater restriction of surface disturbance, which would result in improved vegetative cover, protection of soil crusts, reduction in road development, and a resulting minimization of sedimentation. In situations where OHV cross-country travel would be permitted within a specially designated area, a localized negative impact to water resources could result. The management prescriptions in the majority of specially designated areas provide some measure of restriction for OHV access and minimization of overall surface disturbing activities. This protection would be provided in slightly more acreage than under Alternative A but still a small percentage (less than 20 percent) of the total FFO area.

**Coal Leasing Suitability Assessment**

Impacts to surface water and groundwater quantity and quality have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Additional Coal Interest areas. A majority of the potential coal mine areas drain to the Chaco River, which would have the greatest chance of being affected if new coal mining were approved.

Installation and maintenance of BMPs to reduce surface water runoff and erosion would be required according to BLM policy to meet state and federal regulations. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species would be required. The site-specific potential impacts from new coal

leases would be evaluated in project-specific EAs before approval would be granted by the BLM.

**Air Quality****Oil and Gas Leasing and Development**

Alternative B proposes to develop 13,266 new gas wells on federal lands, which would produce approximately 11,158 Bscf of gas over a 20-year period. Information from the RFDS (Engler et al. 2001) and consultations with natural gas industry representatives (Bays 2001; Brown 2001; Gantner 2001) and the NMAQB (Uhl 2001) were considered in the estimation of emissions for each year of the Alternative. Assumptions used in the emission estimations include the following:

1. The alternative would develop 663 new gas wells each year.
2. Half of the new gas wells would require the use of a 95 HP gas-fired compression unit. Each unit would operate at 100 percent load for 85 percent of the year. The average emission factors from NMAQB source test data of 12 existing wellhead compression units ranging in size from 65 to 145 HP were used to calculate annual emissions from these sources (NMAQB 2001a). The average NO<sub>x</sub> and CO factors obtained from these data were determined to be 13.2 and 13.1 Grams per HP-Hour (gm/HP-hr), respectively.
3. Half of the new gas wells would require the use of a 250,000 British Thermal Units (BTUs) per hour gas-fired separator unit. These units would operate 50 percent of the year at 100 percent load. Emission factors for these sources were obtained from the USEPA (USEPA 1998).
4. An additional 18,000 HP of central compression would be developed in each year of the period of analysis.

These units would operate 100 percent of the year at 90 percent load. The average emission factors from NMAQB source test data of 39 existing units ranging in size from 2,500 to 4,500 HP were used to calculate emissions from these sources (NMAQB 2001a). These factors were determined to be 1.6 and 1.3 gm/HP-hr for NO<sub>x</sub> and CO, respectively.

**Table 4-16** presents estimated emissions from gas production under Alternative B for the first and last year of the 20-year period of analysis. These data show that the overwhelming majority of emissions from this activity would occur from wellhead

compression demands. However, the net change in annual emissions from current levels would be offset somewhat due to the abandonment of existing production. The project emission calculations assume a constant high well compression demand for the life of a given well. The emission estimates for these units may be of importance to future air quality planning in the region. The size of wellhead compressors is generally small enough to fall below the NMAQB permitting and Notice of Intent emission inventory processes, but they represent a potentially substantial future emission source category in the region.

**Table 4-16. Project Year 1 and Year 20 Annual Air Emissions Associated with Gas Production—Alternative B (Tons per Year)**

Equipment Type/Scenario	VOC	CO	NO <sub>x</sub>	PM <sub>10</sub>
<b>Project Year 1</b>				
Wellhead Compression	77.6	3,377.0	3,402.9	0.0
Separator Units	1.1	8.0	18.9	1.5
Central Compression	73.5	201.8	256.5	0.0
<b>Alternative B - Tons per Year</b>	<b>152.3</b>	<b>3,586.8</b>	<b>3,678.3</b>	<b>1.6</b>
<b>P&amp;A Wells - Tons per Year</b>	<b>(8.3)</b>	<b>(340.9)</b>	<b>(344.9)</b>	<b>(0.2)</b>
<b>Alternative B Net Change (Alt B - P&amp;A)</b>	<b>144.0</b>	<b>3,245.9</b>	<b>3,333.4</b>	<b>1.4</b>
<b>Project Year 20</b>				
Wellhead Compression	1,552.6	67,539.6	68,057.2	0.5
Separator Units	22.1	160.6	377.5	30.5
Central Compression	1,470.4	4,035.9	5,130.9	0.3
<b>Alternative B - Tons per Year</b>	<b>3,045.1</b>	<b>71,736.1</b>	<b>73,565.5</b>	<b>31.3</b>
<b>P&amp;A Wells - Tons per Year</b>	<b>(273.7)</b>	<b>(11,273.8)</b>	<b>(11,404.7)</b>	<b>(5.1)</b>
<b>Alternative B Net Change (Alt B - P&amp;A)</b>	<b>2,771.5</b>	<b>60,462.3</b>	<b>62,160.7</b>	<b>26.2</b>

Note: Totals do not sum due to rounding.

### Near-Field Modeling Analysis

Air quality dispersion modeling was used to estimate the near-field pollutant impacts that would occur from implementation of Alternative B. The intent of the analysis was to identify a reasonable but conservative upper bound of impacts that would occur from the

project alternatives. Alternative B was selected for the modeling analysis because it would produce the greatest amount of air emissions and resulting impacts. All other project alternatives would be expected to produce less air quality impacts.

Air quality modeling only evaluated operational emission sources. Proposed construction activities associated with gas development would be similar to the construction activities immediately north of the planning area, described in the Oil and Gas Development on the Southern Ute Indian Tribe (SUIT) Draft EIS (BLM 2000e). This document presents a detailed and conservative modeling analysis of both combustive and fugitive dust (PM<sub>10</sub>) emission sources associated with well pad construction activities. The results of the analysis showed that construction activities would produce pollutant impacts that would remain below the ambient air quality standards. The maximum impacts from proposed construction activities and fugitive dust sources were shown to occur very close to the activity location source, with concentrations decreasing rapidly with distance from the source.

The exact locations of operational emission sources associated with proposed gas development are not known at this time. Therefore, the near-field analysis modeled a reasonable but conservative module of project emission sources. The results of the modeling analysis indicate that impacts from proposed operation emission sources would decrease rapidly with distance from the sources. Therefore, it is expected that distant emissions sources would not substantially contribute to near-field impacts analyzed for the project emissions module. A reasonable but conservative emissions source scenario was developed that would result in an upper bound of impacts that would be expected to occur from any combination of proposed sources within the planning area.

The proposed emissions module was based on information obtained in the RFDS and in consultation with natural gas industry representatives (Bays 2001, Brown 2001, and Gantner 2001). To be conservative, the analysis focused on the Dakota formation, which would potentially develop up to eight wells per section (square mile). The areal extent of the emissions module was four sections that included 32 wells. The RFDS assumes that 50

percent of the future wells developed in the San Juan Basin would have well compressors rated at approximately 95 HP. However, to be conservative, it was assumed that each well would have a 95 HP gas-fired well compressor. The RFDS assumes that the San Juan Basin would require an additional 360,000 HP of central compression. Therefore, a 10,000 HP central compressor station was included as part of the emissions module. This scenario is deemed to represent an upper bound of emissions that would occur under Alternative B.

The emission module source layout has well compressors placed at the center of each 80-acre parcel and the central compressor station situated at the center of the end of the four sections. This arrangement was selected to maximize the overlap of emission plumes that would disperse from the various sources. The well compressors were assumed to be 95 HP Caterpillar, Inc., Model 3304 gas-fired engines. The compressor station was designed with three Caterpillar Model 3312 gas-fired engines, each rated at 3,350 HP. To produce a conservative analysis, the highest emission rates between vendor emission estimates and the NMAQB source test data previously mentioned in the discussion of project annual emission estimations were used in the modeling analysis. As a result, the highest NO<sub>x</sub> and CO emission factors for the well compressors units were determined to be 15.8 (Kaufman 2001) and 13.1 grams per horsepower-hour (gm/HP-hr) (NMAQB 2001a), respectively. The NO<sub>x</sub> and CO emission factors used in the analysis for the Cat 3312 engine were 2.0 and 2.5 gm/HP-hr, respectively. The CO emission factor was based on vendor data (Caterpillar Inc., 2001). The NO<sub>x</sub> emission factor for the 3312 engine provided by Caterpillar was 0.7 gm/HP-hr. However, the analysis used a more conservative NO<sub>x</sub> factor of 2.0 gm/HP-hr to simulate the possible implementation of the emission limitation associated with the Level One Oil and Gas Installations Air Quality Permit issued by the NMAQB under 20NMAC2.72 - Construction Permits.

To further identify maximum impacts, all sources were modeled as operating 24 hours per day and 365 days per year. Stack parameters for modeled emission sources were obtained from Caterpillar, Inc. and the NMAQB.

The Air Quality Technical Report describes: (1) model selection; (2) the modeled emission sources and their stack characteristics; (3) selected emission factors and calculated emission rates; (4) the receptor grids used; (5) selected model options; and (6) meteorological data (SAIC 2002a).

### State and National Ambient Air Quality Standards

The Industrial Source Complex Short Term (ISCST3) model was used to predict the maximum concentrations of criteria pollutants that would occur from the emissions module. Considering that natural gas would be the fuel used by the overwhelming majority of proposed sources, NO<sub>x</sub> and CO will be the pollutants emitted in the greatest amounts. Sulfur dioxide (SO<sub>2</sub>) and particulate emissions (both TSP and PM<sub>10</sub>) would be small, given the low sulfur content and particulate content of the natural gas fuel.

Maximum pollutant impact concentrations and their locations are reported for each of the averaging periods addressed by the national and New Mexico ambient air quality standards in **Table 4-17**. The highest background pollutant concentrations monitored at the Bloomfield station during the period from 1994 to 2000 were added to the maximum predicted project emissions module concentrations, and the resulting total project impacts were compared to the applicable standards to determine their significance. Monitored pollutant data from the Bloomfield station simulate some of the highest pollutant impacts that occur within the planning area from existing sources. The Bloomfield station was sited by the NMAQB to monitor maximum pollutant impacts from the highly industrialized

Bloomfield gas corridor (Uhl 2001). Emissions sources from the El Paso Blanco compressor station and Conoco San Juan Gas Plant occur within 2 kilometers (km) of the Bloomfield monitoring station. These are the third and fifth largest sources of NO<sub>x</sub> in San Juan County, and their combined emissions in 1996 were 2,714 tons of NO<sub>x</sub> (USEPA 2001b). The annual NO<sub>x</sub> potential-to-emit levels for these two facilities are about 3,800 tons per year (NMAQB 2001b). Excluding the Four Corners and San Juan power plants west of Farmington, approximately 40 and 52 percent of the remaining NO<sub>x</sub> emissions emitted in San Juan County occur within 5 and 10 km of the Bloomfield monitoring station. That equates to roughly 3,500 and 5,000 tons per year of NO<sub>x</sub> emissions, respectively, that occurred in 1996 within these radii (USEPA 2001b). There are no other areas within the planning area that have this density of emissions. In other words, monitored pollutant data from the Bloomfield station simulate some of the highest pollutant impacts that occur within the planning area from existing sources. Therefore, the use of ambient pollutant data monitored at the Bloomfield station provides a measure of the most severe air quality impacts from existing sources within the planning area.

As shown in Table 4-17, the maximum predicted concentrations would not cause a violation of the national or state ambient air quality standards. This same result is expected in general for all future oil and gas development in the Farmington region. However, individual groupings of compressor units may have to be examined in detail at the time of permitting if it is determined that nearby terrain could adversely affect the unhindered downwind dispersion of plumes from the compressor sites. In particular, it is possible that several compressor units located close to elevated terrain could cause an impact situation that would exceed the NO<sub>2</sub> 24-hour state standard. Exceedance of any other state or national standard is unlikely.

Table 4-17. Maximum Pollutant Impacts Analyzed for Gas Production—Alternative B

Pollutant	Averaging Period	Modeled Maximum Impact <sup>1</sup> (µg/m <sup>3</sup> )	Background Concentration <sup>2</sup> (µg/m <sup>3</sup> )	Total Impact (µg/m <sup>3</sup> )	NAAQS (µg/m <sup>3</sup> )	NMAAQS (µg/m <sup>3</sup> )
Carbon Monoxide	8-hour	332	6,040	6,372	10,000	9,700
	1-hour	778	10,690	11,468	40,000	15,000
Nitrogen Dioxide	Annual <sup>3</sup>	33	23	56	100	94
	24-hour <sup>4</sup>	120	53	173	—	188

- Notes: (1) Modeling result printouts for maximum impact cases are provided as Attachments 1-4.  
 (2) Background concentration is equal to the maximum value monitored at the Bloomfield monitoring station during the period 1996-2000 (see Table 1 in the Air Quality Technical Report).  
 (3) Annual NO<sub>2</sub> modeled impact is equal to the maximum modeled NO<sub>x</sub> impact times a factor of 0.75.  
 (4) 24-hour NO<sub>2</sub> modeled impact is equal to the maximum modeled NO<sub>x</sub> impact times a factor of 0.4.

The combined impact of the well compressors contributed the majority of the ground level pollutant impacts. The central compressors only contributed approximately 2 percent of the total NO<sub>2</sub> impact for either the annual or 24-hour averaging periods. Despite being larger emission sources, the central compressor units have stack characteristics that produce a much higher plume rise, compared to the well compressors. As a result, by the time the plumes from these larger sources impact ground level, their pollutant concentrations are substantially diluted.

### Prevention of Significant Deterioration

Modeling results indicate that the assumed extreme module of proposed compressor emission sources would generate a maximum annual NO<sub>2</sub> impact of 33 µg/m<sup>3</sup>. This impact is greater than the allowable annual PSD Class II increment (25 µg/m<sup>3</sup>) and is potentially significant. However, the overwhelming majority of emissions that produce this impact occurs from wellhead compressors that are minor sources and not major PSD sources. In addition, the portion of the emissions module that could be regulated under the PSD regulation (the central compression station) is technically not a PSD major source, as its NO<sub>x</sub> emissions would be at most 205 tons per year. A PSD major source for this source type is 250 tons per year of a pollutant. In the event of PSD

review, a detailed analysis would occur on a case-by-case basis at the time of permitting to determine the actual amount of actual NO<sub>2</sub> increment consumption. The analysis would have to consider the increment consumption caused by proposed new units and the baseline consumption of existing PSD sources in the area.

### Impact Radius

The impact radius for the various pollutants and averaging periods of concern (i.e., the distances at which model impacts would fall below the pollutant-specific significance levels) was determined by examining the coarse grid modeling runs. For NO<sub>2</sub>, the distances where the annual and 24-hour averaging period impacts drop below their significance levels of 1 and 5 µg/m<sup>3</sup> would be 40 and 25 kilometers, respectively. For CO, it was determined that all modeled impacts, including the maximum value, would be below the 1- and 8-hour significance levels of 500 and 2,000 µg/m<sup>3</sup>.

### Incremental Risk from Hazardous Air Pollutants

Proposed natural gas-fired sources would emit formaldehyde, a Hazardous Air Pollutant (HAP). This is the only HAP that would pose an appreciable risk to public health from proposed operations. The modeling analysis calculated maximum incremental 8-hour and

annual average concentrations of formaldehyde. The 8-hour concentration can be compared to values of short-term exposure Acceptable Ambient Concentration Levels (AACLs) as reported in the USEPA's National Air Toxics Information Clearinghouse database (USEPA 1997a). The 8-hour AACLs in this database currently range from a low of  $4.5 \mu\text{g}/\text{m}^3$  (Pinellas County Air Pollution Control Board in Florida) to a high of  $71 \mu\text{g}/\text{m}^3$  (Nevada Division of Environmental Protection, Air Quality Control). The modeled maximum extreme 8-hour concentration of  $11.69 \mu\text{g}/\text{m}^3$  would exceed the Florida standard but would be much less than the Nevada standard. The location of the maximum impact would be in close proximity to the well compressor (100 meters). This location would likely be within the well site boundaries and would not be a location of general public exposure.

Long-term incremental exposure to formaldehyde is evaluated based on estimates of the increased latent cancer risk over a 70-year lifetime. The cancer risk is calculated from the maximum annual average formaldehyde concentration predicted by the ISCST3 model times the USEPA unit risk factor for formaldehyde of  $1.3 \times 10^{-5}$  (USEPA 1997b). The resulting estimated cancer risk is compared to the range of accepted cancer risk criteria of an increase of 1 to 100 cancer cases per million people ( $1 \times 10^{-6}$  to  $100 \times 10^{-6}$ ), as found in the Superfund National Oil and Hazardous Substances Pollution Contingency Plan (USEPA 1990).

Two estimates of cancer risk were computed: (1) a maximally-exposed individual (MEI) risk and (2) a most-likely exposure (MLE) risk. The typical USEPA criterion for cancer risk assumes that a person will be continuously exposed to maximum HAP concentrations for a period of 70 years. However, the USEPA allows adjustments to reflect the normal years of residence at a specific location. For the MEI scenario, the exposure duration is assumed to be the typical life of a natural gas well (20 years). Therefore, the MEI residency adjustment factor is  $20 \div 70$ , or 0.286. For the MLE

scenario, the exposure duration is assumed to be 9 years, corresponding to the mean duration that a family remains at a residence (USEPA 1993). Thus, the MLE residency adjustment factor is  $9 \div 70$ , or 0.129.

A second adjustment factor is applied to the MLE scenario to account for the percentage of time during any given day that a potentially exposed person would be at home and therefore exposed to the maximum HAP impact concentration. The USEPA method assumes that 64 percent of the day a person would be exposed to the maximum HAP concentration and during the remainder of the day, the person would be exposed to 25 percent of the maximum HAP concentration (USEPA 1993). Therefore, the MLE daily exposure adjustment factor is  $[(0.64) \times (1.0)] + [(0.36) \times (0.25)]$ , or 0.73. As a conservative assumption for the MEI scenario, it is assumed that a person would remain at home 24 hours per day for the entire period of exposure. Thus, the daily adjustment factor for the MEI scenario is 1.0.

Combining the two adjustment factors results in a value of  $(0.129 \times 0.73) = 0.094$  for the MLE scenario, and  $(0.286 \times 1.0) = 0.286$  for the MEI scenario. To calculate the incremental cancer risk for the MEI and MLE scenarios, the predicted maximum annual average formaldehyde concentration of  $0.8 \mu\text{g}/\text{m}^3$  was multiplied by the formaldehyde unit risk factor and then by the respective overall adjustment factors. The resulting values are  $0.98 \times 10^{-6}$  for the MLE risk and  $3.0 \times 10^{-6}$  for the MEI risk. The MLE risk would be below the range of all acceptable risk criteria, while the MEI risk would be slightly greater than  $1.0 \times 10^{-6}$  but well under the maximum limit of  $100 \times 10^{-6}$ . The area in which the MEI risk would be greater than  $1.0 \times 10^{-6}$  extends out to a distance of approximately 3.9 miles from the center of the emissions source module, or roughly 2.1 miles beyond the edge of the emissions source module. This would amount to an area of about four square miles, the overwhelming majority of which would be within the emissions source module. Since it is expected

that there would be a low probability that residences would occur within or in proximity to this industrialized area, the impact of project emissions under Alternative B on public health would be less than significant.

The near-field dispersion modeling analysis considered the impact of both project emissions and existing emission sources within the planning area. Existing sources were simulated with the use of the highest amount of background pollutant data monitored in the planning area. It is possible that with the increase in gas production in the San Juan Basin, background pollutant levels in the region could increase above current levels. However, the impact of proposed project emission sources, in combination with reasonably foreseeable future emission sources, is expected to produce less than significant cumulative impacts on a localized basis.

### **Far-Field Impact Assessment**

Due to the proximity of PSD Class I areas to the planning area, the air quality analysis qualitatively evaluated the impact of proposed gas development to these locations. The Clean Air Act allows almost no degradation of air quality in Class I areas from proposed emission sources. The Regional Haze Rule promulgated by the USEPA in 1999 directs states to achieve “natural” visibility conditions in Class I Areas within the next 60 years.

The two closest Class I areas to the planning area are Mesa Verde National Park in southwest Colorado and the San Pedro Parks National Wilderness Area in the SFNF in New Mexico. Mesa Verde National Park is about 15 miles from the northwest corner of the major gas production region (high development area). The San Pedro Parks National Wilderness Area is about 10 miles from the southeast corner of the general gas production region and about 30 miles from the high development area.

Criteria used to determine the significance of air quality impacts in Class I areas have been developed for new source review as part of the PSD process (NMAQB regulation 20NMAC2.74). Therefore, air quality impact

analyses in Class I areas primarily focus on major sources of emissions (100 or 250 tons per year of a pollutant, depending on the source type). PSD analyses evaluate the potential for major sources to affect the following air quality related values in Class I areas: (1) Class I PSD increment consumption, (2) visibility, and (3) atmospheric deposition of pollutants. The National Park Service, USFWS, and USFS, as part of their Federal Land Managers’ Air Quality Related Values Work Group process, have developed new source review guidelines for the evaluation of impacts in Class I areas. However, the criteria to evaluate impacts to Class I areas as part of the NEPA process are not well defined.

The SUIT Draft EIS (DEIS) (BLM 2000e) performed a far-field dispersion modeling analysis to estimate cumulative impacts from proposed gas development. Its proposed action includes the maximum development of 636 coalbed methane wells and the addition of 118,000 HP of field compression. The analysis concluded that cumulative impacts could produce a “just noticeable change” to visibility on a single day at the Mesa Verde National Park and up to three days at the Weminuche Wilderness Class I areas. However, due to the conservative nature of the analysis, it is unlikely that these potential visibility impacts would actually occur.

Using the SUIT DEIS far-field modeling analysis as a means to determine the potential for impacts to Class I areas from the FFO proposed actions is difficult. Both projects propose gas development in adjacent regions, although the FFO proposed emission sources are more to the southeast and generally farther away from the Mesa Verde Class I area when compared to the SUIT project sources. As a result, the variations of meteorology and terrain between the two source regions and Mesa Verde would produce somewhat different pollutant transport conditions and ensuing impacts to this Class I area. In addition, substantially higher gas development is proposed in the FFO planning area compared to the SUIT DEIS alternatives. The maximum

amount of emissions modeled for the SUIT analysis was 4,527 tons per year of NO<sub>x</sub>. The peak annual NO<sub>x</sub> emissions from Alternative B could increase by 62,000 tons from current levels, minus the emissions eliminated from the abandonment of existing production wells.

Due to the proximity of the Mesa Verde National Park Class I area to the planning area's high development area in the northwest part of the San Juan Basin and the large magnitude of emissions estimated for Alternative B, the potential exists for gas production emissions under Alternative B to significantly impact visibility in the Mesa Verde National Park. The San Pedro Parks Wilderness is farther away from the area of project high gas development. However, the prevalence of westerly winds in the region could, on occasion, transport substantial emissions from Alternative B to this Class I area.

If any PSD major sources would be installed under Alternative B, they would be evaluated for their impacts to the Mesa Verde and San Pedro Parks Class I areas through the NMAQB PSD review process. However, as shown in Table 4-16, the overwhelming majority of project emission sources would occur from minor sources of emissions.

The far-field analysis considered the impact of project emissions to the Mesa Verde and San Pedro Parks Class I areas. It is possible that with the gradual increase in gas production expected in the San Juan Basin, background pollutant levels in these areas could also increase somewhat from current levels. As a result, the impact of project emission sources, in combination with reasonably foreseeable future emission sources, would potentially produce significant cumulative impacts to visibility resources in the Mesa Verde and San Pedro Parks Class I areas.

### **Mitigation Measures**

#### ***Gas Well Development***

Gas well development would produce air quality impacts from combustive equipment, fugitive dust emissions from earthmoving

activities, and the operation of vehicles on unpaved and paved surfaces. These activities are expected to produce less than significant air quality impacts within the planning area. However, due to the potential impacts to visual and public health resources from fugitive dust, implementation of the following measures would lessen the impact of fugitive dust emissions during gas well development.

The following controls could be implemented at all construction sites during dry conditions:

- Cover all trucks hauling soil, sand, and other loose material or require all trucks to maintain at least 2 feet of freeboard (the space between the top of the load and the top edge of the truck bed).
- Pave, gravel, water, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
- Designate personnel to monitor the dust control measures and to increase the frequency of the above measure in the event that substantial dust emissions leave the construction site.

In addition to the measures listed above, the following measures could be implemented at construction sites that are larger than 4 acres:

- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).
- Enclose, cover, or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).
- Minimize traffic speeds on unpaved roads.
- Install erosion control measures to prevent silt runoff to roadways.
- Replant vegetation in disturbed areas as quickly as possible.

The following control measures are strongly encouraged at construction sites that cover a large area or are located near sensitive receptors.



- Install windbreaks at windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.
- Limit the area subject to excavation, grading, and other construction activity at any one time.

### **Gas Production Sources**

The far-field analysis concluded that planning area emissions from gas production potentially would produce significant impacts to visibility in the Mesa Verde National Park and San Pedro Parks National Wilderness Class I areas. The overwhelming majority of emissions from proposed gas production would occur from wellhead compressors. These relatively small sources generally are unregulated by the AQB unless they are accumulated as part of a large facility with other substantial emission sources. Central compression units that would occur as part of the development of project alternatives generally would be regulated under AQB Construction Permits, Title V Operating Permits, or the PSD regulations. Therefore, the primary opportunity to reduce project operational emissions would be to control emissions from new wellhead compressors.

The NO<sub>x</sub> emission calculations for the proposed wellhead compressors were based on an average emission factor of 13.2 Gm/HP-Hr, as determined from AQB source test data of 12 units ranging in size from 65 to 145 HP. Half of these units had NO<sub>x</sub> emission factors of less than 10 Gm/HP-Hr and the lower NO<sub>x</sub> emission factor of these 12 units was 4.1 Gm/HP-Hr.

Sulfur dioxide, a precursor to sulfates, is the main pollutant that contributes to visual impairment in Class I areas. Sulfates would be emitted by each project alternative at less than significant levels, so they would not be expected to affect PSD Class I areas.

To determine if the 24-hour state standard for NO<sub>x</sub> would be reached or exceeded, FFO staff would track the air quality data recorded at

the two state-operated monitoring stations in northwest NM and the locations and types of wellhead compressors installed. If the data show that the pollutant levels, especially NO<sub>x</sub> and particulate matter, are increasing significantly or that compressors are becoming concentrated in specific areas, the BLM would work with the NM AQB to develop mitigation measures for existing compressors and requirements for new equipment.

One measure that would lessen the impact of emissions from future wellhead compressors associated with project development would be to require a NO<sub>x</sub> emission level of no greater than 10 Gm/HP-Hr for each compressor. Implementation of this measure would reduce NO<sub>x</sub> emissions estimated for Alternative B by about 22 percent.

### **OHV Use**

OHV use and resulting air quality impacts under Alternative B would be similar to or less than those described under Alternative A.

### **Coal Leasing Suitability Assessment**

Coal mining can result in the generation of fugitive dust and equipment emissions that have the potential to affect air quality. If new mines are opened as old ones are reclaimed, no new significant impacts to air quality would be anticipated beyond current conditions. If increased acreage of coal mines are approved, impacts on air quality may occur. When site-specific locations of new coal mines are known, EAs would be developed to analyze the impacts and mitigation measures may be identified in the permitting process.

### **Upland Vegetation**

### **Oil and Gas Leasing and Development**

Most of the existing wells in the planning area are in the piñon-juniper woodlands and Great Basin Desert Scrub plant communities. The amount of long-term vegetation disturbance within the planning area for new wells, roads, pipelines, and compressors on public land would be approximately 38,000 acres. The specific locations of the new wells and other facilities are not known but most

would be constructed in the high development area containing primarily piñon-juniper woodlands and Great Basin Desert Scrub plant community types. Approximately 42,000 acres of these plant communities would have the highest level of disturbance from initial construction for oil and gas development. Areas that are reseeded (13,800 acres) would not return to their original plant cover types in the 20-year period of impacts considered. Surface disturbance and vehicle travel would result in the spread of noxious weeds that can be mitigated through implementation of a weed management plan.

#### **Land Ownership Adjustments**

Over 347,000 acres would be available for disposal and 77,600 acres for acquisition under Alternative B (Table 2-1). The dominant upland plant communities on this land are Great Basin Desert Scrub and Desert Grasslands. Much of this habitat is in close proximity to urban areas and has been degraded by human activity. The disposal of land could have negative effects on upland vegetation if land disturbance activities were to take place. Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on upland plant communities through improved management of natural resources.

#### **OHV Use**

OHV travel in upland plant communities can result in direct plant mortality and spread of noxious weeds, and indirect effects through soil disturbance and the promotion of increased erosion. The amount of land open to OHV use under Alternative B would be 4,616 acres (Table 2-2). The majority of FFO land would be closed or limited for OHV use. The continuation of OHV use in open areas would result in the continued degradation of upland plant communities. However, because the open designation would be only 0.3 percent of the FFO area, much less than under Alternative A, the impacts to vegetation from cross-country travel would be much less, even if some additional acreage would be designated as open in the future (Table 2-4).

#### **Specially Designated Areas**

Many of the areas have management prescriptions that limit vegetative disturbance, OHV access, or grazing. This management would continue to protect vegetation in a limited portion (less than 30 percent) of the FFO.

#### **Coal Leasing Suitability Assessment**

Specific locations of new coal mining areas on FFO land have not been identified. Coal mining has the potential to affect a large amount of land, depending on how many of the currently permitted sites are approved for strip mining. Applications for coal mining would go through the NEPA process and site-specific analysis of the project impacts on upland vegetation would be performed at that time.

#### **Riparian Areas and Wetlands**

##### **Oil and Gas Leasing and Development**

The only specific constraints on oil and gas development that would protect riparian areas are the CSU constraints within approximately 10,000 acres in 2 specially designated areas. There are other riparian areas within the planning area that could be affected by oil and gas development through surface disturbance, construction, and removal of vegetation. While it is impossible to quantify the impacts to riparian areas without knowing the locations of well, road, pipeline, and compressor sites, it is anticipated that there would be impacts to riparian areas from the high well numbers projected to be installed in the high development area. Any construction along the edge or across water bodies or wetlands would be required to meet state and federal requirements for sediment and erosion control, and the developers would be required to obtain permits from the USACE and the NMED in compliance with Section 404 of the CWA and Section 401 of the NMWQCA.

#### **Land Ownership Adjustments**

Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on riparian plant communities, especially if land were acquired in

support of the riparian resource program along the rivers and washes on FFO land.

Approximately 347,500 acres of FFO land would be made available for disposal on FFO land under this alternative (Table 2-1). Designated FFO riparian areas such as the River Tracts would not be included in land being considered for disposal. Land available for acquisition would be 77,500 acres, less under this alternative than under Alternative A. This would result in less potential for a positive impact to biological resources through the acquisition of inholdings and parcels with important biological functions.

### **OHV Use**

OHV use of specially designated riparian areas on FFO land would be limited to designated roads and trails and intermittent wash bottoms (Table 2-3). This traffic can result in the elimination of vegetation in and along the washes, resulting in accelerated erosion and surface water runoff. The OHV traffic in dry washes would continue to degrade these areas. However, the more limited OHV access overall would, in general, provide additional protection to riparian areas and intermittent washes.

### **Specially Designated Areas**

The proposed Ephemeral Wash Riparian Area on 7,459 acres of public land would provide additional protection to these important areas within the FFO. There would be more emphasis on acquiring inholdings within the River Tracts Riparian Area than there would be under Alternative A, which would provide additional protection to those riparian areas by applying the more stringent management prescriptions, as identified in Table 2-5. CSU constraints in over 236,000 acres in specially designated areas under Alternative B would assist managers in avoiding riparian and wetland areas because oil and gas operations can be moved in order to minimize impacts to riparian areas and wetlands.

### **Coal Leasing Suitability Assessment**

Coal mining operations would not take place in significant wetland and riparian habitat

because these areas would be screened out through application of the unsuitability criteria. There is the potential that coal mining could lead to increased erosion and resulting sedimentation in riparian areas, although few exist in the area identified for coal mining. Coal mining has the potential to directly affect arroyos, and permits for such activities may be required. The potential for this impact would be assessed in a project-specific NEPA document. It is not anticipated that coal mining would significantly affect riparian areas, but site-specific analysis would be required once a location has been requested for consideration before this could be accurately addressed.

### **Special Status Species**

Measures are in place to protect species listed and proposed for listing under the ESA that are known to occur or have the potential to occur on federal land in the planning area, as well as for other special status species. The species, critical habitats, and protective measures are listed under Alternative A, Special Status Species.

### **Oil and Gas Leasing and Development**

Implementation of Alternative B would be expected to affect the same special status species as Alternative A. The potential impact on these species would be greater because much more habitat would be affected by the construction of oil and gas facilities. Most of the affected area on FFO land would be in the piñon-juniper woodlands and Great Basin Desert Scrub habitat types.

Special status fauna could be negatively affected by increased habitat fragmentation and human activity. Although the degree of habitat fragmentation cannot be determined because the exact location of the new wells and associated facilities is not known, they would be concentrated in areas already fragmented from oil and gas development. The gray vireo seems to have adapted to current levels of habitat fragmentation in its habitat, but there may be a threshold of habitat fragmentation and disturbance for this and other species beyond which population declines become evident. If

Alternative B is implemented, the increased habitat disturbance and fragmentation and human activity may have negative impacts on the gray vireo and other special status animals in the areas.

Avoidance of special status plants would be required so no impacts would be anticipated. Oil and gas developers would be required to conduct surveys for the Aztec gilia and Brack's cactus. If the plants occur in the area of planned development, the proposed facilities would be moved to avoid the plants.

### **Land Ownership Adjustments**

The amount of land that would be made available for disposal in the tri-cities area is greater under this alternative than under the other alternatives, and typically consists of degraded habitat in close proximity to human activity and is therefore considered marginal habitat. No federally listed or proposed species or their critical habitat are known to occur in land being considered for transfer to local municipalities. Few, if any, other special status species would occur on this land. Occasional migrating ferruginous hawks may occur in this area and loggerhead shrike and burrowing owl have the potential to nest in the area. Surveys for selected special status species would be required before the land transfer could be completed, with mitigation or avoidance required as necessary.

The implementation of this alternative has the potential to affect some relatively undisturbed habitat in the three-mile zone around the tri-cities area, as well as the more degraded areas that occur nearer human habitation. Any habitat of federally listed species that occurs in this area would not be part of a land transfer. Therefore, federally listed and proposed species and their potential habitat would not be directly affected.

### **OHV Use**

The amount of land open to OHV use under Alternative B would be 4,616 acres. The majority of FFO land would be closed or limited for OHV use. Because the open designation would be only 0.3 percent of the

FFO area, much less than under Alternative A, the potential for impacts to special status species from cross-country travel would be much less, even if some additional acreage would be designated as open in the future (Table 2-4). It is possible that OHV access could affect special status species until their existence and habitat are identified by FFO staff during surveys, placed on the conflict map maintained at the FFO, and OHV travel is restricted through the appropriate process and environmental document.

### **Specially Designated Areas**

The Aztec Gilia ACEC would be eliminated under this alternative because this plant is much more widespread on FFO land than originally thought, and the habitat within the ACEC is not representative of optimum Aztec gilia habitat. This would not negatively impact the Aztec gilia because the protective measures described under Alternative A would be required.

The Bald Eagle ACEC would be maintained to protect nesting and use sites from disturbance. An Ephemeral Wash Riparian Area would be created under Alternative B, which would include the ephemeral wash riparian reaches and wetlands designated in the Riparian EIS (BLM 2000c), including over 7,400 acres. The proposed riparian area would provide protection for potential southwestern willow flycatcher habitat, as well as for wildlife habitat in general.

The Mexican Spotted Owl ACEC would be established for the protection of the federally designated critical habitat. Within the boundaries of this ACEC, the management prescriptions would follow the requirements of the Recovery Plan, including the prohibition of cutting of large ponderosa pine and Englemann spruce, and oil and gas development in the mixed conifer forest.

### **Coal Leasing Suitability Assessment**

Knowlton's cactus occurs near Navajo Reservoir, outside the location of the PRLAs, competitive lease tracts, and additional coal interests. The Mesa Verde cactus and Mancos milkvetch are within the Hogback ACEC, which

would not permit coal mining. Potential Colorado pikeminnow, razorback sucker, and southwestern willow flycatcher habitat, as well as federally designated pikeminnow critical habitat along the San Juan River in the River Tracts Riparian Area, would not be affected if coal mining were approved because they would be eliminated through application of the unsuitability criteria. The Bald Eagle ACEC units and the Mexican spotted owl potential and federally designated critical habitats on FFO land are also not close to potential coal mining areas.

The mountain plover is a federal proposed species that may occur in the area of potential coal mining, as shown on Map 4-1. Many of the PRLAs, competitive lease tracts, and additional coal interest areas, occur near or within the plover potential habitat. Coal mining in and near potential mountain plover habitat would require plover surveys to be completed before applications to mine would be approved. In addition, consultation with the USFWS would be required when site-specific applications to mine coal on FFO land are received, in compliance with the Fish and Wildlife Coordination Act, so it is anticipated that mitigation measures would be required to minimize impacts.

### **Fisheries and Wildlife**

#### **Oil and Gas Leasing and Development**

Implementation of Alternative B would not be expected to have an impact on fisheries or other aquatic resources for the reasons discussed under Alternative A, Fisheries and Wildlife.

An estimated 3,653 wells would be developed in the 397,000 acres of public land in wildlife areas in the high development areas under Alternative B. The construction of these wells and associated roads and pipelines would result in the long-term loss of about 11,500 acres of habitat (Table 4-6). The long-term loss of habitat from existing and projected development would be about 30,500 acres or 7.7 percent of the area. An estimated 296 miles of new roads would be constructed, which

would result in an increased road density from 2.6 to 3.1 mi/mi<sup>2</sup>. Habitat fragmentation from the new roads cannot be determined at this time, but the potential decrease in functional habitat within 660 feet of roads could be as much as 47,000 acres. Within 1,320 feet, it could be 95,700 acres. This represents an increase from 46 to 55 percent functional habitat loss within 660 feet and from 75 to 93 percent within 1,320 feet of roads. This is likely to be an overestimation because of the overlap in those areas. These losses would further reduce the carrying capacity of the habitat for mule deer, elk, and other wildlife.

A total of 470 wells would be developed in pronghorn antelope habitat in the Angel Peak area. The estimated amount of long-term disturbance including roads would be about 1,500 acres or 2.9 percent of the total area. About 38 miles of roads would be constructed, resulting in an increase in road density from 2.4 mi/mi<sup>2</sup> currently to 3.0 mi/mi<sup>2</sup>. Functional habitat loss could increase by as much as 6,080 acres (14 percent of the total Angel Peak Wildlife Area) for the 660-foot effects zone, and 12,160 acres (28 percent) for the 1,320-foot road effects zone. This may be an overestimation of this increase due to new roads overlapping existing roads. The increase in habitat disturbance, roads, functional habitat loss, fragmentation, and human activity would have greater impacts on pronghorn antelope under this alternative than Alternative A.

Other species of wildlife would also be affected by oil and gas development, including the displacement of breeding birds. Assuming 100 pairs of breeding birds per 100 acres, the loss of 11,500 acres of land in the 523,700-acre study area could result in the long-term loss of habitat for an equal number of pairs of breeding birds. Many of the breeding birds in this area use the Mixed Coniferous Woodland and Great Basin Desert Scrub habitat, which would not be replaced within the 20-year period of analysis.

Under Alternative B, new wells and roads would result in the long-term loss of an estimated 1,680 acres in the CNF, 28 acres on

the SFNF, 340 acres on USBR land, and 2,500 acres on AFO land. Many of the same species that were assessed above on FFO land also occur on these lands. It is believed that the impacts of this alternative on wildlife in these areas would be less than on FFO land due to the lower numbers of projected wells and roads, resulting in lower levels of habitat fragmentation.

#### **Land Ownership Adjustments**

The amount of additional land that would be made available for disposal in the tri-cities area under this alternative would be more than under the other alternatives. Within a three-mile buffer of the tri-cities area, implementation of this alternative would have the potential to affect some relatively undisturbed habitat as well as the more degraded areas that occur nearer human habitation. Wildlife species associated with the Great Basin Desert Scrub and Desert Grassland plant communities would be affected if the land use and management change under the new owner.

#### **OHV Use**

The potential impacts of OHV activities would be the less than under Alternative A because the access would be more limited.

#### **Specially Designated Areas**

The Critical Big Game Habitat areas would be continued with their timing limitations to protect wintering deer, elk, antelope, and turkeys. Thomas Canyon would be enlarged, and both Carracas Mesa and Thomas Canyon would be managed for wildlife as well as recreational value, resulting in an additional 16,000 acres of public land with a goal of wildlife habitat management.

#### **Coal Leasing Suitability Assessment**

Specific new coal lease areas have not been identified. The coal extraction program on FFO has the potential to affect a large amount of land. Proposed coal operations would go through the NEPA process and an analysis of the proposed project on wildlife would be performed at that time.

### **Wilderness**

#### **Oil and Gas Leasing and Development**

The level of new oil and gas development in areas surrounding the WA and WSAs would be slightly higher than current levels, but could be more than would occur under Alternative A. The nature of the potential indirect impacts would be similar but to a slightly greater degree than under Alternative A. However, under this alternative, the FFO would pursue acquisition of adjacent lands, increasing the manageability of wilderness land. Acquiring additional land around the WAs would enhance management of the surrounding areas in a manner that is compatible with wilderness.

Noise from new compressor sites or well locations could affect peripheral areas of the WA and WSA. To reduce these potential indirect effects, conditions could be applied to new oil and gas development on lands adjacent to the WA and WSA to preserve wilderness qualities, providing protection of natural quiet along the periphery of the protected areas.

#### **Land Ownership Adjustments**

Acquisition of land surrounding the WA and WSAs would reinforce wilderness values and provide for compatible use of lands adjacent to WAs. Other adjustments would be the same as Alternative A.

#### **OHV Use**

There would be no change in OHV designations that close the WA and WSA to OHV use.

#### **Specially Designated Areas**

Designating Ah-shi-sle-pah WSA as an ACEC would provide legislative protection for special resource values and allow for additional control of productive uses regardless of its future wilderness status.

#### **Coal Leasing Suitability Assessment**

Potential coal development in the vicinity of Bisti/De-na-zin WA and in or around Ah-shi-sle-pah WSA would have similar impacts as described for Alternative A. Indirect impacts such as visual, air quality, or sound quality

could affect adjacent WA and WSA areas. Application of the coal unsuitability criteria would prevent direct impacts of coal development in WAs and WSAs.

### **Rangeland**

#### **Oil and Gas Leasing and Development**

Due to the high numbers of projected wells and associated infrastructure that would be constructed under Alternative B, there would be more impacts on rangeland and livestock grazing due to surface disturbance and fragmentation of grazing allotments than under the other alternatives. Impacts would result from the reduction of the acreage of forage available for grazing through surface disturbance, construction of oil and gas facilities, and the increased potential for spreading weeds from more facilities and more travel between them. There would also be more potential for conflicts with oil and gas operations, as described for Alternative A.

#### **Land Ownership Adjustments**

There would be 28 grazing allotments within the area identified for disposal under this alternative that extends three miles from the tri-cities area municipal boundaries. All or part of the following range allotments would be affected by land disposal in this area: 5004, 5005, 5006, 5007, 5009, 5010, 5016, 5018, 5019, 5025, 5028, 5030, 5031, 5032, 5033, 5035, 5037, 5047, 5070, 5072, 5127, 5128, 5140, 5144, 5145, 5146, 5147, 5150.

According to FFO staff (Sanchez 2001), when urban areas extend their boundaries into range allotments, conflicts between adjacent land users arise, especially regarding control of livestock through fencing. FFO policy corresponds with state policy that fencing should be constructed to exclude livestock from an area. However, county and municipal regulations often only require that animals be controlled by their owners. If the local fencing requirements became applicable to permittees grazing cattle or horses near the urban areas, there would be a potential economic impact resulting from the cost of erecting fences to

contain livestock. If the cost of fencing is prohibitive, this could result in permittees giving up their allotments or transferring them to sheep farmers who would use herders to control their livestock.

### **OHV Use**

There would be fewer conflicts between grazing permittees and OHV users, as described in Alternative A, because OHV access would be much more limited than under Alternative A. There would also be fewer opportunities for noxious weeds to be spread by cross-country OHV travel, so weed management problems would be reduced.

### **Specially Designated Areas**

Grazing limitations identified in 22 of the specially designated areas under Alternative B include approximately 8,000 acres that would be closed to grazing, almost 1,000 acres in three areas in which grazing permits would not be reissued if they expire, and 7 acres that would be withdrawn from grazing in these areas. All of these limitations are proposed for public land, and all but the acreage that would not be reissued are currently in effect, so few new impacts on grazing would result.

### **Coal Leasing Suitability Assessment**

Impacts on rangeland and grazing permits from additional coal mining would be the same as that described for Alternative A.

### **Lands and Access**

#### **Oil and Gas Leasing and Development**

About 24,800 acres of land within the FFO would be disturbed over the next 20 years for new oil and gas facilities. About half this disturbance would be for new pipelines and would occur in existing utility and transportation corridors to the extent feasible. These actions would displace existing use on less than 2 percent of the land overlying federal minerals estate in the FFO. This would have little overall effect on multiple use objectives. Specific effects on multiple uses and natural resource values are discussed under their respective resource sections. Use of non-federal

land could also be displaced, or conditions altered, from new oil and gas facilities. BLM would coordinate with surface owners to minimize potential incompatible development, but suitable uses of some areas may be altered.

There would be up to 320 large compressors (over 500 to 10,000 HP) and about 14,000 smaller compressors (about 100 HP) installed at new and existing well sites throughout the oil and gas region. Potential impacts from these noise sources on adjacent uses, such as residences, community facilities, other noise sensitive uses or receptors, would be reviewed on a case-by-case basis. Suitable methods to reduce noise may be incorporated into COAs. However, there are likely to be incompatible adjacent uses in locations throughout the area. Impacts during construction (such as localized noise, dust, and emissions) would be more frequent than under Alternative A, and may be inconvenient and incompatible with some ongoing uses, but would be temporary.

Under Alternative B, about 1,100 miles of new roadway may be constructed as a result of oil and gas development. About 650 miles may be reclaimed resulting in a net increase of about 3 percent over the existing network. Under the new roads program, maintenance of new industry service roads would primarily be borne by industry users. Industry-related traffic is estimated to increase by about 8 to 30 percent from federal oil and gas production and 11 to 22 percent in the planning area over current levels. This would likely generate moderate to significant increases on specific roadways, but it is not known to what degree it would affect traffic flow. Traffic, largely by heavier trucks, is expected to increase the amount of maintenance needed to keep some roads functional. This would be particularly problematic on roads that are currently in poor condition. The road inventory will evaluate existing road condition and capacity for additional traffic. Other access and road-related actions would have similar effects as described for Alternative A.

The creation of new roads, although relatively small proportionately, would exacerbate existing problems that are attributed to the proliferation of roads. With respect to land use compatibility, expanded road access would continue to extend human activity into areas that remain natural at the present time.

### **Land Ownership Adjustments**

In addition to the land adjustments described for Alternative A, disposal of about 347,500 acres in the FFO, including 71,250 acres of BLM land within a 3-mile distance of the tri-cities area corporate boundaries, would be a priority for the FFO. BLM lands within existing or proposed specially designated areas would not be available for disposal, minimizing potential loss of areas with special value. Throughout the FFO, split estate could increase by about 329,300 acres, or about 44 percent over current levels. Most likely, land near the tri-cities area would be leased and patented under various appropriate R&PP Act applications. These transactions would need to be consistent with BLM objectives and stated community needs and goals. Implementation of R&PP disposals would be facilitated by clear community plans for development on disposal parcels. Sales at fair market value may also be executed. The 71,250 acres could increase the non-federal land supply by over 50 percent in the tri-cities area, providing opportunities for community expansion and growth. However, all this land would likely become split estate. The types of suitable uses on split estate lands may be limited by the possibility of incompatible oil and gas development. Future development in these areas would be guided by applicable zoning or subdivision regulations. Potential conflicts between grazing operations on FFO land and adjacent private land could increase if fencing issues are not considered, particularly in disposal actions (see Rangeland).

### **OHV Use**

The default classification of BLM lands in the FFO as limited to cross-country travel could improve conflicts between some OHV uses (such as four-wheeling and motocross) in the



vicinity of residences, particularly closer to developed areas. Also, potential for cross-country travel on private land that is accessible due to public easement along many roads would be reduced. Development of management plans for 13 OHV units would be coordinated with future transportation plans to provide for recreational use of designated trails and areas into the future.

### **Specialty Designated Areas**

BLM would acquire 77,589 acres of non-federal inholdings under this alternative, reflecting proposed adjustments in boundaries of specially designated areas. The effects of acquisitions and disposals would be similar to Alternative A. Accounting for proposed acquisitions, specially managed land could increase by 11 percent over current conditions.

### **Coal Leasing Suitability Assessment**

Several coal leases could be developed under this alternative, including expansion of the San Juan mine and coal interests in the Lee Ranch/Hospah area. Further NEPA analysis would address potential impacts to adjacent non-federal lands as proposal for specific parcels are identified. The San Juan mine is comprised of multiple leases. The existing mining operations and power plant dominate the nearby landscape. Expansion would be consistent with this highly modified industrial area. Residential uses have also developed nearby along Highway 64, likely due to availability of infrastructure, lower land and development costs, and proximity to employment areas. Impacts on nearby residential areas would need to be addressed when expansion areas are defined. Development of any new mine, whether on federal or non-federal land, would also require further environmental analysis. Potential impacts on surrounding land uses would be addressed. A likely location would be the Lee Ranch/Hospah area. The area is generally isolated with very low population. The FFO has no specially designated areas in this location. The 1870s Wagon Road Trail passes through some of the identified coal interests and lease

tracts. A large new surface mine in this area may be visible from sensitive locations (such as cultural sites) for fairly long distances. Impacts from continuing home fuel collection would be the same as Alternative A.

### **Visual Resources**

#### **Oil and Gas Leasing and Development**

The level of oil and gas development on federal minerals under Alternative B would be considerably higher than under Alternative A. About 13,300 new wells are projected with 7,162 at new locations and about 4,400 wells (and associated unused roads) would be reclaimed. A net increase of about 2,760 wells would increase the average density from about 2.0 to about 2.5 wells per square mile in the high development area by the end of the 20-year period of analysis. Considering existing and future development on both federal and non-federal land, well density could increase in the high development area from 2.6 to 3.1 wells per square mile in the high development area. This would increase the overall presence of oil and gas development by about 20 percent over current levels. This would cause noticeable changes to the visual landscape and likely contribute to downgrading of VRM conditions on a regional basis.

About 11,100 wells are projected for land with federal minerals in the FFO area. Accounting for reclamation, an estimated 24,800 acres would be disturbed. However, because of NSO leasing stipulations in some of the VRM Class I and II areas, some wells could not be drilled within these specially designated areas. Therefore, the potential for degradation of visual conditions on the periphery of these areas is high. Enforcement of VRM standards would reduce the effects of development on valued visual resources.

Over 140 projected new wells (on 80 new sites) on USBR land would add to the density of manmade alterations in the landscape. Required setbacks from shoreline and recreational sites would minimize the intensity of visual impacts. Maintaining VRM Class II objectives may be difficult if all projected wells

are permitted. About 700 new wells (involving about 400 new locations) may be drilled in USFS areas (primarily in the Jicarilla Ranger District). USFS policies would favor oil and gas production and would allow above-ground pipelines and new roads to be constructed, increasing the potential for visible modifications. Under this alternative, the impact of manmade modifications in the landscape would become more evident and visual conditions would decline.

#### **Land Ownership Adjustments**

The emphasis on land disposal under this alternative would put additional land at risk for future development without VRM constraints throughout the FFO area. Similar impacts from development on non-federal lands as described for Alternative A would also apply. In the tri-cities area, 26,600 acres of BLM land would be high priority for disposal. None of the 10 specially designated areas within the tri-cities area disposal area have VRM Class I or II rating; therefore, the overall sensitivity of these areas to any future changes is relatively low.

#### **OHV Use**

Limiting OHV use to roads and trails and concentrating cross-country use into very localized areas would limit potential scarring and visual degradation that can be caused by off-road travel. This would limit potential visual impacts in the FFO on a widespread basis and benefit visual resources. Fairly lenient policies on exclusions for cross-country travel (i.e., access by permittees and incidental access for camping sites) could result in visible two-tracks.

#### **Specially Designated Areas**

Management of FFO lands for VRM objectives under this alternative would be similar to Alternative A. However, expansion of some specially designated areas would increase the amount of land managed for VRM Class I and II classifications to about 13 percent of the FFO area. This is a slight increase over current conditions. This would have a minimal minor benefit on visual resources.

Overall, considerable impacts could result to visual resources on federal lands under this alternative, primarily due to increases in oil and gas infrastructure, and, to a lesser degree, from some permitted and incidental cross-country OHV use. With the enforcement of VRM objectives, impacts can be avoided in the most sensitive and valued areas.

#### **Coal Leasing Suitability Assessment**

Potential impacts of Alternative B to visual resources would be similar to Alternative A. Any large new surface mining operation could cause considerable change in nearby areas, and be visible for great distances. Impacts could result in the vicinity of San Juan mine through expanded operations. This could affect the visual quality of the proposed Piñon Mesa Trail Recreation Area and could expose travelers along nearby roadways to increased visual impacts. Development of coal interests in the Lee Ranch/Hospah area could affect viewsheds of sensitive cultural resources. The surrounding area is particularly rich in Chacoan sites, including the Chaco Culture National Historic Park.

#### **Cultural Resources**

##### **Oil and Gas Leasing and Development**

The higher projected surface disturbance under this alternative would potentially affect 2,211 archaeological sites (Table 4-10). As under Alternative A, archaeological sites in the Largo, Carrizo, La Plata, and Upper San Juan watersheds would be most affected by this alternative. Site quantities in the Largo watershed may be underestimated.

This alternative would result in an increase of almost 1,100 miles of new roads (Table 2-3) in the high development area, which would greatly increase public access to archaeological sites and TCPs. An increase in vandalism would be anticipated due to increased public access.

#### **Land Ownership Adjustments**

None of the significant known cultural sites and TCPs would be included in disposal parcels. Acquisition of inholdings would benefit cultural resources within specially designated

areas because sites would be protected by a single land owner (FFO) and a comprehensive management plan.

### **OHV Use**

OHV access would be limited to maintained and graded roads in most of the FFO area, so there would be less potential than under Alternative A for archaeological sites to be damaged by vehicles driving across the landscape.

### **Specially Designated Areas**

Special protection from such uses as oil and gas activities, mineral entry, land disposal, vegetation management, grazing, and OHV activities would be provided to important cultural sites in 86 specially designated areas that are either SMAs or ACECs within approximately 40,400 acres in the FFO area. All of these areas would be designated as noise sensitive.

### **Coal Leasing Suitability Assessment**

When specific locations of proposed coal mines are known, cultural resource clearance would be required before approval. Any archaeological sites or TCPs that are found would be avoided or mitigated. Clearance, avoidance, and mitigation would also be required before mining coal for home fuel use. Therefore, impacts to cultural resources would either be minimized during the approval process, or sites would be documented through mitigation before coal mining would begin.

### **Paleontology**

#### **Oil and Gas Leasing and Development**

Alternative B would involve the most acreage of surface disturbance and have the greatest potential for impacts to paleontological resources due to the highest projected well numbers. CSU constraints would limit oil and gas development impacts to paleontological resources within 9 specially designated areas, resulting in more protection than would occur under the 4 areas in Alternative A.

### **Land Ownership Adjustments**

There would be no impact to known paleontological resources from land disposal because the resources would be surveyed prior to land transfers and important paleontological resources would not be available for disposal. If inholdings within 4 existing and 5 proposed specially designated areas were acquired, more paleontological resources would be protected through implementation of management prescriptions than under Alternative A.

### **OHV Use**

The limited OHV designation in most of the FFO area would greatly reduce cross-country travel and the resulting damage to slopes, soils, and vegetation that could affect paleontological formations through directly destroying surface fossils, wearing down rock formations, or accelerated soil erosion. By eliminating areas with shallow bedrock from consideration for open OHV designation in the future (Table 2-10), impacts to paleontological formations would be avoided.

### **Specially Designated Areas**

By proposing 5 new paleontological areas, more paleontological resources would be protected under this alternative than under Alternative A. Over 135,000 acres of public land containing known important formations would be protected through the implementation of management prescriptions within 9 specially designated areas.

### **Coal Leasing Suitability Assessment**

An inventory of paleontological resources would be required prior to mining, as well as documentation or collection of vertebrate specimens uncovered during mining, in compliance with an agreement between the BLM and the State of New Mexico. This documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing them from their original context. More areas are under consideration for coal mining. Consequently, there could be the potential for additional impacts if additional

coal mining were to be approved in areas where unidentified paleontological resources occur.

## **Recreation**

### **Oil and Gas Leasing and Development**

Under this alternative, development of 11,100 new oil and gas wells in the FFO area could cause a net displacement of 1.8 percent of the FFO lands that are open to the public for recreation. All of this land is within the high development area in the northeast half of the planning area. This should have minimal effect on the availability of dispersed recreation throughout the FFO area.

Some stipulations on oil and gas development in areas specially managed for recreation would be changed. Relatively more recreation land would have NSO restrictions. This stipulation would prevent oil and gas development directly on a larger portion of special recreation areas. The existing 409 wells in these areas would increase by about 427 new wells, almost doubling the amount of associated infrastructure, vehicular traffic, noise, and visual modification. They would cause minor displacement of recreational use on about 2.4 percent of the recreation areas and somewhat increase road density and oil-and-gas-related traffic over current levels. Accounting for wells that would be plugged and abandoned, the average well density in recreation areas would increase by about 105 percent. Excluding the areas specially developed for OHV use, this is likely, over time, to degrade the quality of opportunities for outdoor recreational activities that enjoy quiet and natural surroundings.

It is expected that about half the new wells within recreation areas would have compressors that generate noise. Noise could become more prevalent and scattered throughout these areas, as well as the rest of the highly productive oil and gas area. Conflicts between noise sensitive uses would be addressed and mitigated on a case-by-case basis. Because of existing stipulations and protective laws, the WA and WSAs would be

relatively unaffected by oil and gas and motorized vehicle use. Along the periphery of these areas, there may be indirect effects from changes in visual quality and incidental noise sources from activities on adjacent lands.

About 320 larger (500 to 10,000 HP) compressors and about 14,000 small well-site compressors would also be sited throughout the oil and gas areas. Noise reduction measures may be required for some sites near residences and some developed recreation sites, but many would not be mitigated on the current case-by-case basis. Consequently, noise generated by these facilities could be incompatible with quiet outdoor activities in some locations.

Impacts on recreation to AFO land would be similar to Alternative A. There would be about 1,300 new wells on AFO lands, but based on resource potential, very few in the recreation areas. There may be localized effects on dispersed recreation, primarily from visual alterations and compressor noise.

Under this alternative, the areas around Navajo Lake would have a CSU stipulation. The number of new wells around the lake could increase from 128 to 290 (half expected to have compressors) over the next 20 years. Controlled surface use stipulations and VRM II classification allow for more careful siting of new wells, minimizing potential conflicts with recreation areas. Noise from existing well compressors and its effect on quality recreation has been a concern. The number of new noise sources could have impacts on recreational uses if not reduced through site modifications. Wells would be sited as much as possible to avoid lakeside and rim locations that are easily visible from the lake or campsite areas. However, new development would likely be noticeable to recreationists, as are existing facilities.

About 700 new wells are projected for the USFS lands, primarily in the Jicarilla Ranger District. This level of development would more than double traffic on some forest roads, add over 50 miles of new roadway, and introduce new noise sources from compressors to areas where people undertake dispersed recreational

activities. A variety of current management practices would be relaxed to facilitate development that would contribute to less desirable conditions for quality dispersed outdoor recreation. Road densities could increase over 0.5 mi/mi<sup>2</sup>, the established planning objective for the Jicarilla Ranger District, requiring amendments to the existing Forest Plan. Increased evidence of human activities (sight, sound, and disturbance) over current levels would degrade conditions for a variety of outdoor recreational pursuits in natural settings. Increased erosion, sedimentation, and habitat fragmentation resulting from increased road density would indirectly affect wildlife, vegetation, and visual quality desired for quality dispersed outdoor recreation. Specific recreation sites may be affected by visual and audible intrusions of oil and gas facilities if not mitigated by siting and other physical methods.

Similarly, about 160 new wells around Navajo Lake could affect the visual quality and sound levels around the primary recreation sites such as Pine River Recreation Emphasis Area, Sims Mesa Recreation Emphasis Area, and San Juan River Management Area. Use of noise-reducing methods could minimize some of the audible impacts.

Overall, changes in visitation levels for recreational activities are difficult to predict, but visitor satisfaction would likely decline as scenic and acoustic quality declined in popular and remote recreation areas throughout federal land under this alternative.

### **Land Ownership Adjustments**

Under a management framework of maximizing productive use and access, lands would be more easily available by sale and under the R&PP Act. An area around the tri-cities area of 71,250 acres would be available for disposal. This could mitigate the shortage of land for development in the urbanizing tri-cities area. Established or proposed recreation areas that are near the tri-cities area would not be available for disposal unless proposals include plans for recreational uses. Disposal and

development of favored recreation areas would be detrimental to recreational opportunities unless this is the proposed use of the receiving entity. BLM would review all proposals for consistency with BLM objectives, compatibility with adjacent public land uses, and public purposes. Preferably, these would be documented in planning documents or well-supported in community involvement initiatives. Acquisition of inholdings in recreation areas would improve management and access for recreation.

### **OHV Use**

Expansion of the OHV management units to cover the entire resource area under a default "limited" classification would dramatically alter potential for cross-country travel. There would continue to be fairly lenient provisions for exceptions and certain uses (such as residents, emergency access, permit holders) that would allow for some travel off roads in "limited" areas. Also, as OHV plans for each unit are developed, public input would be used to further define areas that may be suitable for cross-country travel. A preliminary screening identified about 100,000 acres of BLM land that may be suitable for OHV and cross-country use in addition to specially designated areas comprised of 4,616 acres. The advantage of this approach is that particularly suitable areas could be used for cross-country sports, and potential damage to areas with other resources values would be reduced.

Considering the extensive road network in the oil and gas development area, access by the public for most purposes and to most areas (either productive or recreational), would remain high. This alternative would provide added protection for natural and cultural resources, and provide benefits for some recreationists that prefer opportunities for quiet and natural experiences.

Under this alternative, the trail system would be expanded by almost 300 percent with 94 miles of new trails. Trails would greatly augment appropriate recreational facilities for both motorize and unmotorized vehicle use.

The proposed trails would be located close to the larger population centers, providing ready access.

### **Specially Designated Areas**

As shown in Table 4-13, the amount of land specially managed for recreation would decline slightly (due to reducing the size of the GRTS area). While this is not significant in quantity, four popular areas in proximity to the tri-cities area would become recreation areas: Alien Run Mountain Bike Trail, Piñon Mesa Trail, Rock Garden, and Navajo Lake Horse Trails. These new areas would respond to the need and demand for additional and segregated trails for motorized and un-motorized vehicles and horseback riding. This would have a beneficial effect on recreational opportunities in the FFO area. ROS classifications shown in Table 4-12 would apply to about 32,000 additional acres, providing a standard for maintaining a mix of recreational opportunity and for managing road density and other development in these areas.

In addition to changes in stipulations on oil and gas development, changes in management prescriptions would generally be applied to protect a range of resource values that would indirectly benefit recreation. Examples include restrictions on shooting in developed sites, reclamation efforts using native plant species, a policy of no land disposals within specially designated areas, clearances for surface disturbing activities, and case-by-case review of new ROWs. Renaming three recreation areas would provide more informative description of their resource value for recreationists. This would be particularly useful for out-of-region visitors.

### **Coal Leasing Suitability Assessment**

Development of coal leases, PRLAs, and coal interests has the most potential to affect dispersed recreation in the remote badland areas around Bisti/De-na-zin WA and Ah-shi-sle-pah WSA. Development around the WSA, whether designated or not, could indirectly influence exceptional landscape qualities for persons recreating in that area.

Development of the San Juan mine could expand the immediate area affected by mining operations. Areas surrounding Farmington are used for a variety of recreational activities. Changes in visual and sound quality from expanded coal operations could affect the quality of recreational experiences west of Farmington. This is particularly relevant for the proposed Piñon Mesa Trail Recreation Area. If the San Juan mine expanded into this proposed area, it would prevent recreational use until mining officially ceased.

### **Noise**

#### **Oil and Gas Leasing and Development**

The major cause of noise impacts would be the increased number of wellhead compressors associated primarily with gas operations. With 13,266 new wells projected under Alternative B, and 14,400 existing wells on land with federal minerals, this could result in almost 14,000 small wellhead compressors scattered throughout the high development area. Noise from the wellhead compressors from mechanical parts and exhaust ranges from 91 to 107 dBA at the source when operating at 100 percent load (Wagner Power Systems 2002).

In addition to the wellhead compressors, it is estimated that 20 large compressors (2000 to 10,000 HP) and 300 mid-size compressors (500 to 2,000 HP) would be installed under Alternative B. Noise from these compressors, assuming that they are gas-fired, would range from 44 to 69 dBA at a distance of 500 feet and 89 dBA at a distance of 50 feet from the source.

Actual noise impacts from gas operations would be highly variable, depending on the type of compressor and muffler, location, distribution, and terrain of the compressor sites. Noise impacts would be mitigated near identified golden eagle, ferruginous hawks, and prairie falcon nests in compliance with the FFO raptor noise policy.

Individually, the noise generated by the small compressors may be an annoyance for

residents or visitors to the planning area. Also, a significant impact on the human environment could result from the combined noise of many compressors of different sizes in an area. Noise impacts under this alternative would increase as new wells and compressors are added and would be much greater than under Alternative A because there would be 4,400 more small compressors and 174 more large compressors in use over the 20-year period. These would continue to be mitigated on a case-by-case basis.

### **Land Ownership Adjustments**

If public land becomes non-federal land through disposal or exchange, increasing the non-federal landowners and land users in the high development area, it is possible that there would be additional conflicts over noise, if more people live or recreate in areas interspersed with gas wells.

### **OHV Use**

Limiting OHV use to designated roads and trails could lessen noise in remote areas. Many more maintained roads would be constructed in the high development area and used by OHVs. This would contribute to intermittent traffic noise in the immediate surrounding area for the long-term. Development of OHV management plans may identify trails and OHV open areas where noise would be generated. Proximity to existing sensitive receptors would be considered in identifying open areas in the future.

## **Social and Economic Conditions**

### **Employment**

Under this alternative, based on a total of 13,266 new wells and reclamation of 4,398 wells per year over the next 20 years, there would be an increase of about 1,020 development jobs per year in the planning area over current levels employed in oil- and gas-related jobs. There would also be a gain in annual maintenance jobs (about 1,300) after 20 years, resulting in a 20 percent increase in oil and gas employment on federal land after 20 years. This would have a positive impact on local oil and gas industry employment and

earnings in the planning area, and minimal impact overall for the region. However, industry jobs would still be subject to boom-bust cycles due to market-driven demands.

Under this alternative, coal mining jobs associated with federal minerals would not be expected to decline with expansion of existing mines and possible new operations on competitive lease tracts, recent coal interests, and PRLAs. If several new locations become productive, this could result in substantial job increases for the coal industry, but fairly minor increases for the region. There is a shortage of experienced underground miners, so this type of operation would likely draw from other states.

### **Expenditures**

Under the Alternative B, the estimated cost for drilling 13,266 wells is almost \$7.2 billion, at an average cost of \$541,000 per well. No commingling of wells was assumed for this alternative. These costs assume about 110 directional wells, or approximately 1 percent of the total number of projected wells, for this alternative. Additional direct costs would increase the total investment to almost \$8.1 billion. Additional indirect expenditures could result in a total of \$10.3 billion spent over 20 years or an average of \$517 million per year (non escalated). This represents a threefold increase in expenditures for federal oil and gas development compared to Alternative A, and over 20 percent increase above current expenditures. This alternative would provide the greatest influx of expenditures into the local and regional economies and somewhat outpace the estimated expenditures if current development were continued.

### **Revenues**

Under Alternative B, the projected oil and gas production volume on federal land over the next 20 years is estimated at 11,158 Bcf. Because oil is a very small percentage of production in the San Juan Basin, these calculations are based on gas values. Assuming a value of \$3.00 per Mcf, the total value of this

product could be about \$33.5 billion (in 2001 dollars). The volume of production each year would slowly increase, more than doubling current levels in 20 years. Therefore, potential effects on tax revenues would be significant from increasing production. Other factors, primarily product value and tax rates, would be far more influential in future tax revenue potential.

Under this alternative, additional coal leasing could be pursued. However, a recent industry study of coal production indicates that overall production from mines on federal land in the Four Corners area is not expected to increase over the next 20 years. Some mines are likely to lose production while others increase or expand. Therefore, overall production and value of coal are not expected to change significantly. Expansion of the San Juan Basin mine, and development of federal minerals on the coal lease tracts rather than non-federal minerals, would benefit total federal royalties paid to the State of New Mexico. Additional development could extend the lifespan of coal resources in the basin.

Grazing may be displaced from land that is used for oil and gas development or where new management prescriptions would withdraw grazing. Under this alternative, about 2 to 3 percent of the FFO land would no longer be available for grazing. New oil and gas development could affect small pieces of many allotments throughout oil and gas fields. This may slightly reduce the amount of permitted AUMs and therefore the amount paid to the FFO. Slightly reduced cattle numbers would lower the total productive value in the FFO by about 2 to 3 percent under current levels. Although the value is small in relative terms, the marginal viability of cattle ranching and potential loss of lifestyle values would remain of concern. The potential impact to local and regional cattle ranching under this alternative would be minimal.

### **Environmental Justice**

Effects on minorities and low-income populations would be essentially the same as

under Alternative A. Effects of compression noise may be widespread and could be incompatible with adjacent uses, especially near communities or homes. Tribal entities and BIA would review APDs on tribal surface land and contribute to COAs to reduce impacts of new oil and gas facilities. Increases in oil and gas-related jobs could provide some benefit for the local labor pool particularly in Rio Arriba. McKinley County would benefit economically from development of a new mine in the Lee Ranch/Hospah area, but no specific proposals are identified at this time.

## **ALTERNATIVE C – RESOURCE CONSERVATION**

### **Surface Disturbance Due to Oil and Gas Development**

The assumptions and methods used to determine impacts are described under Alternative A. The amount of long-term surface disturbance associated with well construction would be 18,197 acres under Alternative C. Surface disturbance associated with large pipelines would be 11,559 acres. The total amount of surface disturbance associated with future compressor installation (Phase 1 and Phase 2) would be approximately 1,680 acres for Alternative C. There would be an additional 10,200 acres of initial short-term surface disturbance that would be revegetated after construction.

Subtracting reclaimed acreage of 13,194, the net amount of long-term surface disturbance under this alternative would be 18,238 acres (Table 4-1). This does not include plugged and abandoned wells already awaiting approval for reclamation.

### **Watersheds**

Under Alternative C, initial short-term surface disturbance is estimated to total almost 31,500 acres (Table 4-2) due to construction of new wells, roads, and small pipelines. As under Alternative A, it was assumed that the majority of the earthmoving for large pipelines and compressors would be located in the high



development area in the northern part of the FFO area. The largest anticipated acreage of surface disturbance would occur in the same watersheds most affected under Alternative A: Upper San Juan, Largo, Navajo Reservoir, Carrizo, Animas, La Plata, Blanco, Gobernador, Pump Canyon, Middle San Juan, and Kutz Canyon, in descending order (Table 4-2).

Under this alternative, there would be an increase ranging from 22 to 173 miles of new roads in 11 of the 19 watersheds, resulting in an increase in unpaved roads ranging between 1 and 13 percent of those watersheds. The total increase would be approximately 797 miles in the planning area (Table 4-3). This would result in an increase in sediment yield overall, with the largest increases anticipated in the same watersheds that would have the highest percentage of unpaved roads and bare ground from construction of new wells, pipelines, and roads.

Most of the soils in the watersheds with the majority of the predicted surface disturbance and new road construction are moderately to highly erodible due to rainfall and surface water runoff. Most of these watersheds are in the low to moderate category for wind erosion. It is likely that significant erosion and sedimentation would be caused by increased initial surface disturbance, which would be reduced once well pads, roads, and pipelines are stabilized by seeding and the establishment of surface water controls.

## **Geology and Minerals**

### **Oil and Gas Leasing and Development**

Implementation of Alternative C assumes that commingling and dual completions would be common. The number of completions allowed to extract federal minerals under this alternative would be 9,836 after consideration of surface stipulations that would eliminate access to 134 wells. NSO restrictions would require 195 directional wells (2 percent of all wells on federal minerals) to be drilled to access reservoirs under specially designated areas and

USBR land. There would be 114,100 acres closed to new leasing.

There would be a NSO restriction placed on all of the USBR land that would eliminate access to 102 wells and limit resource extraction to 64 directional wells drilled outside of the USBR boundary. Spacing and density rules would determine the actual number that could be developed.

The implementation of the proposed Noise Policy would add restrictions and additional mitigation requirements to gas wells in or near NSAs, but would not affect extraction of the mineral resources.

Because small quarries of less than 5 acres are frequently excavated to supply sandstone and gravel for stabilizing roads to oil and gas wells, it is anticipated that, as the number of new well pads increase, so would the number of quarries in the high development area. Therefore, there would be more quarries constructed under Alternative C than Alternative A, but fewer than under Alternative B. These quarries would be approved with the APDs or through other BLM permitting procedures, and would be located in areas that avoid impacts to natural and cultural resources.

### **Land Ownership Adjustments**

Under current management 338,067 acres of public land would be available for disposal, of which approximately 304,450 acres contain federal minerals, mostly located in the areas identified as suitable for coal mining and in the vicinity of the tri-cities area. If this land leaves federal ownership, there would be a potential for complications in extracting these minerals because coordination between the non-federal landowner and the federal mineral manager would be required. Land disposal transactions would be required to consider impacts to the 6 salable mineral areas.

The potential for conflicts between competing users of the land in the vicinity of the 6 salable mineral areas delineated in Map 2-5 would be less than under any other

alternative because the disposal area would be limited to Crouch Mesa in the tri-cities area.

### **Specially Designated Areas**

The primary effect on oil and gas development from the designation of special areas would be the limitation imposed on the management of resources within their boundaries in the FFO. Due to NSO constraints within specially designated areas in the FFO, there would be 32 wells that would not be developed and 131 wells that could be developed if directional drilling were used. With more acreage within specially designated areas, there would be more limitations on mineral extraction operations and leasing than under the other alternatives.

Locatable minerals would not be affected by oil and gas development, but would be withdrawn or closed in most of the specially designated areas. There would be little impact on the extraction of locatable minerals, however, because most of these limitations are in specially designated areas that are not in the vicinity of the locatable minerals in the planning area.

### **Coal Leasing Suitability Assessment**

There would be fewer potential conflicts for mineral extraction under this alternative because fewer areas would be considered for coal mining, by limiting the PRLAs to those outside the Ah-shi-sle-pah WSA and by not considering the Additional Coal Interest areas for new mining. The total number of oil and gas wells approved over the next 20 years would be lower under this alternative than all but Alternative A, and there would be more restrictions on mineral leasing within specially designated areas.

The areas identified as suitable for coal development after application of most of the unsuitability criteria (378,275 acres) are outside the high development oil and gas area, but conflicts would still have the potential to arise in the Fruitland Formation mineral resources.

## **Soils**

### **Oil and Gas Leasing and Development**

Due to the higher numbers of projected new well locations, roads, and pipelines, this alternative would have more short-term and long-term impacts on soils from oil and gas activity than Alternative A, but less than Alternative B. Initial short-term surface disturbance from construction of new wells, pipelines, and roads would amount to approximately 31,500 acres (Table 4-2). When accounting for the reclamation of P&A wells, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be 17,000 acres more than under Alternative A. The resulting impacts to soils would be an increase in soil erosion, but the amount of erosion would be determined by the location of the construction on the landscape and the mitigation measures (BMPs) used.

There is the potential for more impacts to prime farmlands due to more construction associated with oil and gas development than under Alternative A because the watersheds with the most prime farmland soils are within the high development area.

### **OHV Use**

Limited OHV access over most of the FFO area would result in the potential for less damage to soil crusts and vegetation, and thereby less potential for sheet, rill, and gully erosion, through enforcement of regulations. Increased soil erosion would be expected to result where OHVs are permitted to ride on existing trails because OHV traffic would increase soil compaction and further reduce any existing vegetative cover, and prevent its reestablishment. Because additional open designations would not be made under Alternative C, this alternative would result in the fewest impacts to soils from OHV use.

### **Coal Leasing Suitability Assessment**

Impacts to soils have the potential to occur as a result of coal mining in the PRLAs and competitive lease tracts. A majority of the

potential coal mine areas are located within the Chaco Wash watershed, which would have the greatest chance of being affected if additional coal mining were approved. Most of this watershed is moderately susceptible to water erosion, high salinity, and has low susceptibility to wind erosion, which would be accelerated if additional coal mining were started.

Inclusion of BMPs in future coal leases to reduce surface water runoff and erosion would be required to meet state and federal regulations and would minimize accelerated erosion. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species are preferred but not required under this alternative. Site-specific impacts on soils from new coal leasing would be evaluated in project-specific EAs before issuance of the leases by the BLM.

## **Water Resources**

### **Oil and Gas Leasing and Development**

Under Alternative C, new oil and gas development would result in a net increase in surface disturbance of about 18,200 acres. Water required for the drilling operations would amount to approximately 7,100 acre-feet, assuming 5,600 barrels per well would be needed.

In general, potential long-term impacts to surface water resources would result from an increase in sedimentation and salt yields due to more surface disturbance than under Alternative A. Peak runoff rates would increase due to removal of vegetation and compaction of soils on new roads and well pads, but the direct impacts would depend on the location of the new facilities in each watershed and their distance from drainages, rivers, and other water bodies.

There would be an increase in potential short-term impacts to water resources as a result of sedimentation from the increased acreage of initial surface disturbance during construction. Potential impacts to groundwater

could result from infiltration in unlined pits or spills from oil and gas operations. The short- and long-term impacts to surface water and groundwater would be minimized through the use of BMPs and pollution prevention measures as required by federal and state regulations.

### **Land Ownership Adjustments**

Modification of BLM land ownership would not directly impact water resources. Depending on the modifications implemented, indirect impacts to water resources could result if land management changes due to land transfers. The smaller disposal area in the vicinity of the tri-cities area that would be considered for development could result a lower potential for an increase in water use in the region than under Alternative B, but possibly more than Alternative A, if the land were to be developed for public use.

Potential uses of any land that would be transferred under Alternative C are currently unknown. Therefore, it is not possible to analyze impacts to water resources. When these uses are proposed in the future, subsequent NEPA analysis would be required to determine the specific impacts.

### **OHV Use**

Because the acreage of open designations for OHVs would be greatly reduced under Alternative C and no additional open designations would be considered, potential impacts to water resources would be less than under all other alternatives. Localized impacts to water resources would continue to occur on lands where cross-country travel is permitted.

### **Specially Designated Areas**

Alternative C contains the highest acreage of specially designated areas (713,710) and the most restrictive management prescriptions for surface disturbing activities. Depending on the location of the area, there is a potential to positively affect water resources through improved land management practices and greater restriction of surface disturbance, which would result in improved vegetative cover, protection of soil crusts, and a resulting

minimization of sedimentation. This protection would be provided in 49 percent of all the public land in the FFO area.

### **Coal Leasing Suitability Assessment**

Impacts to surface water and groundwater quantity and quality have the potential to occur as a result of coal mining in the PRLAs and competitive lease tracts. A majority of the potential coal mine areas drain to the Chaco River, which would have the greatest chance of being affected if new coal mining were approved.

Installation and maintenance of BMPs to reduce surface water runoff and erosion would be required according to BLM policy to meet state and federal regulations. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species would be required. The site-specific potential impacts from new coal leases would be evaluated in project-specific EAs before approval would be granted by the BLM.

### **Air Quality**

#### **Oil and Gas Leasing and Development**

Alternative C proposes to develop 9,836 new gas wells on federal lands, which would produce approximately 10,840 Bscf of gas over a 20-year period. This production rate is only slightly less than production estimated for Alternative B. As a result, emissions from the development of gas wells would be less (estimated at 98%) for Alternative C than Alternative B, due to limitations on surface disturbances through NSO constraints. Emissions from gas production and resulting ambient air quality impacts would be only slightly less for Alternative C, compared to Alternative B.

### **OHV Use**

A policy that limits vehicular use to designated open areas, maintained roads, and designated trails would reduce the amount of ground disturbance in the planning area. This would reduce the potential for fugitive dust

emissions and wind-blown dust. As a result, OHV use and resulting air quality impacts under Alternative C would be less than under Alternatives A or B.

### **Coal Leasing Suitability Assessment**

Coal mining can result in the generation of fugitive dust and equipment emissions that have the potential to affect air quality. If new mines are opened as old ones are reclaimed, no new significant impacts to air quality would be anticipated beyond current conditions. If increased acreage of coal mines are approved, impacts on air quality may occur. When site-specific locations of new coal mines are known, EAs would be developed to analyze the impacts and mitigation measures may be identified in the permitting process.

### **Upland Vegetation**

#### **Oil and Gas Leasing and Development**

The amount of long-term vegetation disturbance within the planning area for new wells, roads, pipelines, and compressors on public land would be approximately 31,400 acres. Initial surface and vegetation disturbance during construction would affect an additional 10,300 acres, which would be reseeded once regular operations begin. The specific locations of the new wells and other facilities are not known but most would be constructed in the high development area containing primarily piñon-juniper woodlands and Great Basin Desert Scrub plant community types. Areas that are reseeded would not return to their original plant cover types in the 20-year period of impacts under consideration, resulting in direct impacts to vegetation.

Surface disturbance promotes the germination of noxious weeds, and equipment that travels from well to well would spread weeds. This would result in the proliferation of weeds that compete with native vegetation unless mitigated through implementation of a weed management plan. Revegetating disturbed areas with the appropriate native plants would benefit the upland vegetation plant communities.

**Land Ownership Adjustments**

Approximately 338,000 acres of land would be available for possible disposal under Alternative C. The disposal of land could have negative effects on upland vegetation if land disturbance activities were to take place, similar to that described for Alternative A. An estimated 190,000 acres would be available for acquisition (Table 2-1), more than would be available under Alternatives A and B. This would result in an increased potential for positive impacts to upland vegetation relative to Alternatives A and B through implementation of vegetative management practices and a weed management plan on more acreage in the FFO. This has the potential to have a beneficial impact on upland plant communities, especially if the land were acquired in support of a resource program because vegetation-disturbing activities would be limited and localized.

**OHV Use**

All FFO land would be designated as limited, requiring that OHVs stay on maintained roads unless otherwise designated open or closed. Cross-country travel would not be allowed except under certain limited circumstances on 4,616 acres of public land in the FFO (Table 2-3). The acreage of closed areas would be greater than under Alternatives A or B (Table 2-2), and OHV use of 2-track roads or trails would only be allowed in designated areas. The potential for OHV traffic to degrade upland plant community types and spread weeds would be less than under the other alternatives.

**Specially Designated Areas**

There would be additional limitations on surface occupancy for oil and gas, restrictions on mineral access, and more limited OHV access within specially designated areas under Alternative C. There would be more acreage within these areas than under any other alternative, so the limitations on land use, such as vegetation-disturbing activities, OHV access, or grazing, would be applied to more public land within the FFO area than under the other

alternatives. If inholdings are acquired, implementation of weed management plans would be more successful on land with contiguous federal ownership.

**Coal Leasing Suitability Assessment**

Specific locations of new coal lease areas on FFO land have not been identified. Coal leases would affect less land under Alternative C because only the PRLAs outside of the Ah-shi-sle-pah WSA and the competitive coal tracts would be considered for coal mining. Proposed coal mining would go through the NEPA process and site-specific analysis of the proposed project impacts on upland vegetation would be performed at that time.

**Riparian Areas and Wetlands****Oil and Gas Leasing and Development**

The only specific constraints on oil and gas development that would protect riparian areas are the NSO constraints on oil and gas development within the 100-year floodplain of Ephemeral Wash Riparian Area and the CSU constraints within most of the 10,000 acres of public land in the River Tracts and Ephemeral Wash Riparian Areas. There are other riparian areas within the planning area that could be affected by oil and gas development through surface disturbance, construction, and damage to vegetation. While it is impossible to quantify the impacts to riparian areas without knowing the actual locations of well, road, pipeline, and compressor sites, it is anticipated that there would be impacts to riparian areas from erosion and sedimentation caused by construction of oil and gas facilities in the high development area, although the impacts under Alternative C would be less than under Alternative B and more than under Alternative A. Any construction along the edge or across water bodies or wetlands would be required to meet state and federal requirements for sediment and erosion control, and the developers could be required to obtain permits from the USACE and the NMED in compliance with Section 404 of the CWA and Section 401 of the NMWQCA.

**Land Ownership Adjustments**

Land acquisition would consolidate inholdings on FFO land and has the potential to have a beneficial impact on riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes on FFO land. Designated FFO riparian areas such as the River Tracts and Ephemeral Wash Riparian Areas would not be included in land being considered for disposal, so no impacts would result.

**OHV Use**

OHV use of the River Tracts and other protected riparian areas on FFO land would be limited to maintained roads and designated trails. OHV cross-country travel would be prohibited in intermittent washes unless an area is specifically designated for such use (Table 2-3). Therefore, the potential for negative impacts to riparian areas and washes from OHV use would be less than under the other alternatives, as long as the limitations are enforced.

**Specially Designated Areas**

The addition of the Ephemeral Wash Riparian Area would increase protection of riparian areas within the FFO. The increased acreage of CSU and NSO constraints in specially designated areas within the FFO would assist managers in avoiding riparian and wetland areas because they can require that oil and gas operations be moved in order to minimize impacts to specific resources. The 58,553 acres with closed designations for OHV use are all in specially designated areas and would help to limit damage to riparian and wetland areas that may be within the boundaries.

**Coal Leasing Suitability Assessment**

Coal mining would not take place in significant wetland and riparian habitat because these areas would be screened out during the application process. There is the potential that coal mining could lead to increased erosion and resulting sedimentation in riparian areas, although fewer areas would be considered

under Alternative C than under Alternative A. Coal mining has the potential to directly affect arroyos, and permits for such activities may be required. The potential for this impact would be assessed in a project-specific NEPA document. It is not anticipated that coal mining would significantly affect riparian areas, but site-specific analysis would be required once a location has been requested for consideration before this could be accurately evaluated.

**Special Status Species****Oil and Gas Leasing and Development**

Alternative C would stress conservation of natural resources while allowing for increased oil and gas development. It is estimated that there would be disturbance of over 31,000 acres of land with federal minerals. This would be an increase in disturbed land over Alternative A, and a decrease in disturbance from the acreage under Alternative B. Most of this disturbed land would be in the high development area, which is principally in the piñon-juniper woodlands and Great Basin Desert Scrub habitats.

Oil and gas development under Alternative C would not result in adverse effects to listed or proposed species or the adverse modification of critical habitat because the protection measures described under Alternative A, Special Status Species, would be implemented. The BLM would continue to manage non-federally listed species with the goal of contributing to the conservation of these species to reduce the potential for their being listed under the federal ESA.

**Land Ownership Adjustments**

As under Alternatives A and B, habitat for federally listed and proposed species would be retained and protective measures for other sensitive species would be implemented as appropriate. Land acquisition would benefit special status species by consolidating public land where there is potential habitat. Land ownership adjustments would have no negative impact and possibly a positive impact on special status species.

### **OHV Use**

Under this alternative, more land would be designated as closed or limited for OHV use than under Alternatives A and B. No additional land would be opened to OHV access. OHVs would be required to stay on graded, maintained roads outside designated areas. OHV use of 2-track roads and trails would only be allowed in areas designated by FFO staff and no OHV travel in wash bottoms would be permitted. Therefore, the potential for OHV traffic to degrade special status species or their habitat would be low, less than under Alternatives A and B.

### **Specially Designated Areas**

The modifications and additions of specially designated areas to protect special status species described under Alternative B would also be proposed under Alternative C. The Mexican Spotted Owl ACEC would replace the existing Laguna Seca SMA and management would implement the Recovery Plan to provide protection for this species. The Ephemeral Wash Riparian Area would provide protection to potential habitat for the southwestern willow flycatcher.

### **Coal Leasing Suitability Assessment**

The development of land suitable for coal mining under Alternative C has little potential to affect federally listed species or designated critical habitat. Knowlton's cactus occurs near Navajo Reservoir, outside the location of the PRLAs and competitive lease tracts. The Mesa Verde cactus and Mancos milkvetch are within The Hogback ACEC, which would not permit coal mining. Potential Colorado pikeminnow, razorback sucker, and southwestern willow flycatcher habitat, as well as federally designated pikeminnow critical habitat along the San Juan River in the River Tracts Riparian Area, would not be affected if coal mining were approved because they would be eliminated through application of the unsuitability criteria. The Bald Eagle ACEC units and the Mexican spotted owl potential and federally designated critical habitats on FFO land are also not close to potential coal mining areas.

The mountain plover is a federal proposed species that may occur in the area of potential coal mining (Map 4-1). Many of the PRLAs and competitive lease tracts occur near or within the plover habitat. Coal mining in and near potential mountain plover habitat would require surveys to be completed and clearances issued before applications to mine would be approved. In addition, consultation with the USFWS would be required when site-specific applications to mine coal on FFO land are received, in compliance with the Fish and Wildlife Coordination Act.

Proposed commercial coal mining, and mines for home fuel use, would go through the NEPA process with documentation once exact locations are known, and an analysis of the proposed project impacts on special status species would be performed. Protective measures would be required once potential sites and impacts are known.

### **Fisheries and Wildlife**

#### **Oil and Gas Leasing and Development.**

Implementation of Alternative C would not be expected to have an impact on fisheries or other aquatic resources for the reasons discussed under Alternative A, Fisheries and Wildlife.

The general impacts of oil and gas development and operations on wildlife would be greater than under Alternative A because more wells and roads are projected to be constructed, but less than under Alternative B. This alternative would include the establishment of 13 Wildlife Areas to manage big game and other wildlife, encompassing almost 397,000 acres of public land (Map 2-6).

An estimated 2,700 wells would be developed in the 397,000-acre study area under Alternative C, and the construction of these wells and associated roads would result in the long-term loss of almost 8,600 acres of habitat. The total long-term loss of habitat from existing and projected development would be over 27,500 acres or 6.9 percent of the area (Table 4-6). An estimated 219 miles of new

roads would be constructed in the Wildlife Areas, which would result in an increased road density from 2.6 to 3.0 mi/mi<sup>2</sup>. Additional functional habitat loss within 660 feet of roads could be as much as 35,200 acres; 70,400 acres within 1,320 feet. This represents an increase from 46 to 52 percent functional habitat loss within 660 feet and 75 to 88 percent within 1,320 feet of roads. This estimated increase in functional habitat loss is likely to be overestimated due to overlap of those fragmented habitat areas.

This habitat loss would be likely to further reduce the carrying capacity of the wildlife habitat. The exact level of this reduction cannot be quantified for the same reasons given for Alternative A. The 397,000-acre area would be managed for big game and other wildlife mainly through prohibitions of some oil and gas operations in the winter and spring and vegetation management. Alternative C would be expected to result in a reduction of the mule deer and elk populations in the planning area due to habitat loss and fragmentation from oil and gas development. This reduction would be less than under Alternative B due to the implementation of wildlife management practices in the 13 Wildlife Areas and the construction of fewer new well pads and roads.

A total of 348 wells would be developed in the Angel Peak Wildlife Area that is important to antelope under this alternative. The estimated amount of long-term disturbance including roads would be 1,100 acres or 2.6 percent of the total area. About 28 miles of roads would be constructed, resulting in an increase in road density from 2.4 mi/mi<sup>2</sup> to 2.8 mi/mi<sup>2</sup> for this alternative. The increase in habitat disturbance, roads, and human activity would have greater impacts on pronghorn antelope under this alternative than Alternative A but less than under Alternative B.

Other species of wildlife would be affected by oil and gas development under this alternative, including the displacement of breeding birds. Assuming 100 pairs of breeding birds per 100 acre, the loss of almost 8,600 acres of public land in the 397,000-acre area

could result in the long-term loss of habitat for an equal number of pairs of breeding birds. Many of the breeding birds in this area use the piñon-juniper woodlands and Great Desert Scrub habitats, which would not be replaced within the 20-year period of analysis by reclamation or revegetation.

Under Alternative C, new wells and roads would result in the long-term loss of an estimated 1,680 acres in the CNF, 27 acres in the SFNF, and 2,500 acres on AFO land. Many of the same species that were assessed above for FFO land also occur on these lands. It is believed that the impacts of this alternative on wildlife in these areas would be less than on FFO land due to the lower levels of habitat disturbance projected. No habitat loss would occur on USBR land because of NSO stipulations on oil and gas development.

#### **Land Ownership Adjustments**

The amount of land that would be available for disposal under this alternative would be about 338,000 acres of public land (Table 2-1), which is slightly more than under Alternative A, and less than under Alternative B. More land would be considered for acquisition under this alternative because there would be more land within specially designated areas for which acquisition of inholdings would be a priority. This has the potential to have greater positive impacts on wildlife than under Alternatives A and B, especially since more of the land to be acquired would be within the better wildlife habitat areas in the FFO.

#### **OHV Use**

Most FFO land would be designated for limited OHV use under this alternative (Table 2-2) and OHVs would be required to stay on graded maintained roads. OHV use of 2-track roads or trails would be allowed only in designated areas and cross-country travel in washes would not be permitted in most cases (Table 2-3). Therefore, the potential for OHV traffic to degrade wildlife habitat would be lower than under the other alternatives.



### **Specially Designated Areas**

Wildlife management, particularly for big game, would be expanded under this alternative to include Angel Peak, Cereza Canyon, Cox Canyon, Crow Mesa, Delgadito Mesa, East La Plata, Ensenada Mesa, Gonzales Mesa, Laguna Seca Mesa, Manzanares Mesa, Middle Mesa, Rattlesnake Canyon, and Rosa Mesa Wildlife Areas, as well as the Ephemeral Wash Riparian Area. Within the Laguna Seca Mesa Wildlife Area would be the Mexican Spotted Owl ACEC. The land within these wildlife areas support resident and wintering herds of deer, elk, and antelope, a viable population of wild turkey, and other wildlife, as noted in Table 2-5 under the management prescriptions for each wildlife area.

The Angel Peak Wildlife Area would become a designated wildlife area, which would lessen the impacts on pronghorn antelope through the implementation of timing limitations for oil and gas operations between May 1 and July 15. There would also be prescriptions in the Angel Peak Wildlife Area to manage vegetation for the needs of antelope, quail, and neo-tropical migratory songbirds that are dependent on sagebrush and grasses. Management prescriptions in the 13 Wildlife Areas would reduce the potential impacts of surface disturbance activities on wildlife.

### **Coal Leasing Suitability Assessment**

Specific locations of new coal lease areas on FFO land have not been identified. Coal leases would affect less land under Alternative C because only the PRLAs outside of the Ah-shi-sle-pah WSA and the competitive coal tracts would be considered for coal mining, resulting in fewer impacts on wildlife. Proposed coal mining would go through the NEPA process and site-specific analysis of the proposed project impacts on wildlife habitat would be performed and documented once locations of applications are known.

### **Wilderness**

#### **Oil and Gas Leasing and Development**

Impacts from oil and gas development on the WA and WSAs would be the same as described for Alternatives A and B. Gradual increase in the new wells in surrounding areas could have some indirect impacts on wilderness qualities from changes in overall landscape quality and noise sources. Under this alternative, a Noise Policy would require that noise from any noise source (primarily compressors) be at levels of 48.6 dBA or lower in the WA and WSA. Some peripheral locations may therefore experience noise levels that are higher than ambient levels that one would expect to experience in a wilderness setting.

#### **Land Ownership Adjustments**

A policy favoring acquisition over disposal, particularly on the edges of the WA and WSA would support wilderness values. Acquired lands inside the WA would be managed as wilderness, expanding protection of wilderness values. Acquiring lands in surrounding areas would minimize potential for indirect impacts of future development on adjacent wilderness qualities.

#### **OHV Use**

There would be no change in OHV designations that currently close the WA and WSA to OHV use.

### **Specially Designated Areas**

Future designation and protection of the Ah-shi-sle-pah WSA would be the same as under Alternative B.

#### **Coal Leasing Suitability Assessment**

Impacts from coal mining would be the same as described for Alternative B.

### **Rangeland**

#### **Oil and Gas Leasing and Development**

Impacts due to surface disturbance and fragmentation of grazing allotments under Alternative C would be greater than Alternative A and less than Alternative B. The same types of effects from the removal of forage in the high

development area where oil and gas facilities should be constructed, the potential for poisoning if fences are not maintained around well pads, and the spread of noxious weeds, would exist.

#### **Land Ownership Adjustments**

The priority under this alternative would be land acquisition, rather than disposal. There would be few new impacts on permittees near the urban areas because it would be less likely that land in these areas would be transferred out of federal control. The range allotments that would be affected are 5028, 5030, and 5032 on Crouch Mesa if land disposal were to be considered.

#### **OHV Use**

Impacts on rangeland would be less under this alternative than Alternatives A and B because OHV access would be limited to maintained and graded roads in most areas. This would result in fewer conflicts between OHV users and grazing permittees, and less potential for OHVs to spread noxious weeds.

#### **Specially Designated Areas**

Grazing limitations identified for some of the specially designated areas under Alternative C include approximately 52,000 acres closed to grazing, over 11,000 acres in which grazing permits would not be reissued if they expire, and over 600 acres that would be withdrawn from grazing. Grazing restrictions would be proposed in 67 specially designated areas. Because acquisition of inholdings would be a priority within these areas and the specially designated areas cover more acreage, grazing allotments in the areas where grazing permits remain would consist of more contiguous land than under Alternatives A and B after acquisition is complete.

#### **Coal Leasing Suitability Assessment**

Impacts on rangeland and grazing permits from additional coal mining would be the same as that described for Alternative A.

### **Lands and Access**

#### **Oil and Gas Leasing and Development**

Under this alternative, the level of oil and gas development would be less than under Alternative B, and is reflected in lower estimated surface disturbance and displacement of multiple use activities. Of the projected 18,238 acres disturbed, over half would be in existing ROWs and infrastructure corridors.

There would be 316 large new compressors, and about 4,920 small compressors at new well pads, in addition to about 7,000 small compressors at existing wells gradually installed over the next 20-year period. Oil and gas facilities would need to meet a 48.6 dBA level at 100 feet of any dwelling or occupied structure. This standard would apply to new facilities in municipal areas if no appropriate standards exist. The standard meets compatibility guidelines established by the U.S. Department of Housing and Urban Development for all developed uses, including residential. Therefore, noise impacts on residential and commercial uses are expected to be minimal. The FFO would apply a maximum 48.6 dBA noise standard on 266,273 acres of public land in 88 designated noise sensitive areas, selected to protect recreational use, cultural sites, and wilderness values. These measures would reduce potential for incompatible noise levels with other uses on public and non-public land. Compared to Alternative B, with fewer small compressors and implementing the proposed Noise Policy, this alternative would have less potential for noise impacts, particularly at sensitive locations such as homes, occupied buildings, and specially designated noise sensitive areas.

Impacts to ongoing land uses from noise, dust, and emissions during development of new oil and gas facilities would be temporary and minor. They would occur less frequently than under Alternative B, but more than Alternative A.

Under Alternative C, an estimated 800 miles of new oil and gas roads could be constructed. Accounting for road reclamation, a

net increase of 150 miles (or 1 percent) may result. Oil and gas-related traffic on regional and gas field roads is estimated to be similar to current levels to as much as 18 percent higher than Alternative A. Therefore, no change to traffic flow would result from this alternative.

### **Land Ownership Adjustments**

Under this alternative, BLM would tend to retain land in federal ownership and acquire inholdings. This would benefit continuity in access, assuming ROWs on private land are maintained in a timely manner. Up to 338,067 acres could be disposed of, particularly if suitable acquisition areas were identified. The disposal area around the tri-cities area would be confined to the Crouch Mesa triangle. A smaller amount of BLM land (almost 14,000 acres) would become available for future urban growth and development, and nearly all would become split estate. Increase from split estate within the FFO administrative area would be similar but slightly less than Alternative B. Mineral development could be incompatible with high levels of residential development that is already occurring on Crouch Mesa. Impacts would be similar but less extensive than those described for Alternative B.

Designation of the WRCS ROW corridors would provide for a managed approach to siting new infrastructure, potentially minimizing future disturbance and fragmentation from proliferating corridors. However, the specific alignment of new corridors would need to be environmentally cleared prior to designation.

Identification of valuable locations for salable minerals would allow for consideration of future access to these resources in any disposal actions that may involve these areas. This could limit future uses on some disposal areas in the tri-cities area.

### **OHV Use**

Limited OHV access throughout the FFO should lessen conflicts between OHV users and adjacent private property owners. Disturbance of cattle and ranching operations should also decline with less pervasive access.

### **Specially Designated Areas**

BLM could acquire 189,679 acres of non-federal inholdings within specially designated areas under this alternative, reflecting proposed new and adjustments within their boundaries. Accounting for proposed acquisitions, specially managed land could increase by 84 percent over current conditions. Over 64 percent of BLM land in the FFO would be in a specially designated area. Effects of acquisitions would benefit valuable natural, recreation, cultural, and wildlife resources. Application of management prescriptions on these acquired lands could reduce the availability of lands for mineral entry, grazing, and other productive uses. Most of this land is in remote areas and would not affect the need to divest federal ownership near urban areas. Acquisition of inholdings in specially designated areas near the tri-cities area would benefit the recreational and open space needs of the urban area. Both community members and city planners have expressed this as a desired resource and for the expanding area and buffer against urban sprawl.

### **Coal Leasing Suitability Assessment**

Under this alternative, expansion of existing coal mines in the FFO would not occur and only suitable portions of 14 PRLAs would be available for future production. Indirect impacts on the WSA could occur if a surface coal mining operation were developed adjacent to the WSA, indirect effects from noise, visual changes, and increased human activity could lessen the potential for a natural experience in the southern part of the WSA. There would also be potential to affect sensitive viewsheds of several cultural sites and the Chaco Culture National Historic Park, depending on location of any future mine. Impacts from continuing home fuel collection would be the same as Alternative A.

### **Visual Resources**

#### **Oil and Gas Leasing and Development**

Under this alternative, about 5,300 new well locations are projected for areas overlying

federal minerals and about 4,400 well sites reclaimed. A net increase of 830 well sites would increase the average well density on federal land from 2.0 to about 2.2 wells per square mile in the high development area. This represents a 6 percent increase in the overall presence of oil and gas features. Impacts would be similar to those described for Alternative B, but would be less pervasive and contribute to potentially moderate changes in the overall landscape character.

The same degree of change would occur in areas with VRM Class I and II objectives. Leasing stipulations would prevent some development of wells directly within these specially designated areas, but impacts could occur from directional drilling on adjacent areas with lower VRM objectives and indirectly affect visual values within the specially designated areas. Therefore, there is potential for degradation of visual conditions on the periphery of these areas. Closure of most VRM I areas to new oil and gas leasing would provide some additional protection. Enforcement of VRM standards would reduce effects of development on valued visual resources. This would continue to be managed primarily through selecting locations that are less visible but still operable in terms of extracting the resource.

Protection of visual values would be emphasized both on USBR and USFS lands under this alternative. Several measures, including NSO stipulations on USBR land around Navajo Lake, would lessen visible degradation, push new development back from the shoreline, and likely lessen the number of permitted new wells. Increasing the distance would reduce the visibility of new wells, but other mitigations may also be needed to meet VRM II objectives. USFS would require siting and physical mitigations to meet VRM objectives and minimize the visibility of new wells.

#### **Land Ownership Adjustments**

Under Alternative C, land adjustments would favor retention of federal land and allow

for management of visual values. Acquisition of inholdings in specially designated areas would increase the acreage of public land in areas with high visual value and protection in the FFO.

#### **OHV Use**

A policy that limits vehicular use to roads and designated trails would prevent damage to soil and vegetation throughout the FFO area. To the degree that new restrictions can be enforced, this would prevent unsightly conditions caused by either repeated cross-country travel (that denudes vegetation, and causes visible scarring of the land and the spread of weeds) or heavy vehicles passing over wet ground (that cause deep ruts). The policy on cross-country travel exceptions, and permittees and lessees, would be much more restrictive, allowing few cross-country exceptions.

#### **Specially Designated Areas**

With the expansion of specially designated areas, VRM Class I and II objectives would apply to more land within the FFO area (Table 4-9). The amount of land managed for VRM I and II objectives would increase to almost 18 percent of the FFO area. This would provide a strong basis for management decisions that conserve visual quality in the most values areas, providing a benefit for visual resources. New areas would be designated specifically for OHV use to concentrate motorized sports into specific locations. This would confine visual deterioration from OHV use to a much smaller area and benefit visual resources.

Overall, Alternative C would have the least impact on visual resources. Visual alterations from moderately aggressive levels of oil and gas development would be assuaged by emphasis on minimizing visibility of new development. Confining cross-county OHV use in the FFO area to a few areas would limit vegetative loss and soil damage that can alter the landscape.

#### **Coal Leasing Suitability Assessment**

Development of adjacent PRLAs could have indirect effects on viewsheds surrounding

the WA and WSA if a new surface mine were developed. Visual resources would be protected in other parts of the FFO area through resolution of conflicts between new production and visual values.

### **Cultural Resources**

#### **Oil and Gas Leasing and Development**

This alternative would potentially affect approximately 1,658 archaeological sites in the same four watersheds described in Alternative A: Largo, Carrizo, La Plata, and Upper San Juan (Table 4-10). Cultural resource surveys and clearances would be required prior to issuance of APDs, and avoidance or mitigation of identified sites would be required.

The 796 miles of new roads (Table 4-3) constructed to serve oil and gas facilities would provide greater public access to cultural resources in the high development area, resulting in increased potential for vandalism.

#### **Land Ownership Adjustments**

None of the significant known cultural sites and TCPs would be included in disposal parcels. Acquisition of inholdings would benefit cultural resources within specially designated areas because sites would be protected by a single land owner (FFO) and a comprehensive management plan.

#### **OHV Use**

OHV access would be limited to maintained and graded roads in most of the FFO area, so there would be less potential than under Alternative A for archaeological sites to be damaged by vehicles driving across the landscape. No additional areas would be opened for OHV access, so there would be less potential for site damage than under Alternative B.

#### **Specially Designated Areas**

Special protection from such uses as oil and gas activities, mineral entry, land disposal, vegetation management, and OHV activities would be provided to important cultural sites in 79 specially designated areas that include approximately 89,000 acres in the FFO area.

Most of these areas would be designated as noise sensitive under Alternative C.

#### **Coal Leasing Suitability Assessment**

When specific locations of proposed coal mines are known, cultural resource clearance for commercial mines or home fuel use would be required before approval. Any archaeological sites or TCPs that are found would be avoided or mitigated. Clearance, avoidance, and mitigation would also be required before mining coal for home fuel use. Therefore, impacts to cultural resources would either be minimized during the approval process, or sites would be documented through mitigation before coal mining would begin.

### **Paleontology**

#### **Oil and Gas Leasing and Development**

Alternative C would involve less acreage of surface disturbance and have fewer potential impacts to paleontological resources than under Alternative B, but more than under Alternative A. CSU constraints would limit oil and gas development impacts to paleontological resources within 9 specially designated areas, resulting in more protection than would occur under the 4 areas in Alternative A.

#### **Land Ownership Adjustments**

Impacts on paleontology would be the same as Alternative B.

#### **OHV Use**

Impacts on paleontological resources would be similar to Alternative B. However, no additional areas would be designated open to OHV access, so there would be less potential for impacts to paleontological formations from OHV use than under any other alternative.

#### **Specially Designated Areas**

By proposing 5 new paleontological areas, more paleontological resources would be protected under this alternative than under Alternative A. Over 135,000 acres of public land containing known important formations would be protected through the implementation of management prescriptions within 9 specially designated areas.

### **Coal Leasing Suitability Assessment**

An inventory of paleontological resources would be required prior to mining, as well as documentation or collection of vertebrate specimens uncovered during mining, in compliance with an agreement between the BLM and the State of New Mexico. This documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing them from their original context. With only 9 PRLAs (14 minus 5 within Ah-shi-sle-pah WSA) available for coal mining under this alternative, there would be the least potential for impacts to paleontological resources if additional coal mining were to be approved.

### **Recreation**

#### **Oil and Gas Leasing and Development**

Existing well density in the recreation areas would increase, having similar relative impacts as described for Alternative A from changes in visual surroundings, isolated noise sources, traffic, and other oil and gas activity. The total portion of the FFO that may be displaced in recreation areas is somewhat less than under Alternative B (1.4 percent compared to 2.4 percent), and dispersed over a larger area (75,174 acres). The resulting average well density in recreation areas would increase by about 63 percent over existing conditions in recreation areas (Table 4-11).

Under this alternative, the 48.6 dBA or lower noise standard would apply to over 206,000 acres with federal minerals in the FFO. With the exception of the areas developed for motorized vehicle recreation, recreation areas are designated as noise sensitive and would be protected under the Noise Policy. This policy would apply to oil and gas development adjacent to the WA and WSA. While this provides benefits over current conditions, noise levels of 48.6 dBA would not be desirable for many outdoor dispersed recreational activities.

Impacts on dispersed recreation and campgrounds on USFS land would be less than under Alternative B due to fewer new wells

(about 510) and application of the proposed Noise Policy. Also, USFS would implement several constraints and practices that would conserve the natural environment and landscape, providing indirect benefits to recreation. Impacts on USBR lands from oil and gas development would be less than those described in Alternative B due to the NSO constraints. Most new well sites would tend to be located further from recreation sites, minimizing direct visual and acoustic impacts on visitors.

### **Land Ownership Adjustments**

In general, retaining land in federal ownership would tend to preserve land for public access and multiple use, including recreation. Only land on Crouch Mesa would be disposed of in the tri-cities area, reducing the potential for conversion of open space to urban use. This is a desirable conversion since it is difficult for BLM to monitor recreational activity on areas that are highly accessible to a large number of persons. Similar to Alternatives A and B, the BLM would review applications for exchange or lease and patenting under R&PP Act for consistency with recreational objectives. Open space for recreation would be preserved around the tri-cities area under this alternative.

### **OHV Use**

Under this alternative, a limited OHV designation would be applied throughout the FFO area unless otherwise designated. Vehicles would need to stay on maintained roads, such as oil field service roads, and designated trails. This policy is intended to simplify current policies and correct ambiguities that make enforcement by BLM and compliance by the public problematic. Cross-country travel would no longer be allowed in the FFO area, except in small designated areas.

Table 2-2 shows that less than 1 percent of federal land in the FFO would have an open designation under Alternative C. This would occur only on 4,616 acres within areas specially managed for cross-country OHV uses (the Dunes and portions of GRTS). No additional land would be considered for possible open

designation. These restrictions are expected to reduce impacts on soil and limit loss and deterioration of vegetative cover. Also, noise from OHV use would be more controllable and predictable. Areas adjacent to the Dunes and Head Canyon may still experience incompatible noise. New Recreation Areas, particularly Rock Garden and Piñon Mesa, would have developed trails for OHV use. People who prefer unconstrained access to public lands would not favor these restrictions. Other recreationists would benefit from the lack of disruption caused by cross-country motorized vehicle use. The trend to provide separate trails and areas for different classes of conveyance would lessen some of the conflicts currently reported by recreationists. Designation of 94 miles of new trails would benefit a variety of motorized and non-motorized vehicles.

### **Specialty Designated Areas**

Similar to Alternative B, Alternative C would respond to some specific recreational needs in the FFO area. These have mostly been identified through meetings with local user groups and observations of BLM specialists.

Specially managed recreation areas would increase in extent by almost 60 percent (to 83,293 acres) over current conditions, and represent 6 percent of the FFO area. This would benefit recreational opportunities by providing protection of these values on more land. Four new Recreation Areas are close to the tri-cities area and would therefore directly benefit local users. The areas identified would generally be larger than under Alternative B with more extensive NSO stipulations on oil and gas development. ROS classifications would also be allocated to additional land. As shown in Table 4-12, the amount of land under ROS management would double over current conditions. However, due to current road density and intended motorized use of some of the new areas, they would mostly be managed for the least stringent classifications (Rural and Roaded Natural). More emphasis would be placed on preserving visual qualities (see Visual

Resources). This would benefit a large range of outdoor recreational pursuits.

Changes in management prescriptions for recreational areas and other resource areas would generally benefit the quality of recreational opportunities to a greater degree than under Alternative B. Prescriptions would be more conserving of natural and real estate resources that benefit recreation than under Alternative B. For example, some sensitive areas would be closed to new ROWs, developed sites may be closed to shooting (for safety reasons), and additional areas may be closed or withdrawn from grazing or mineral entry and leasing. Also, VRM Class I would be maintained wherever it currently applies. As under Alternative B, appropriate and manageable portions of recreation areas near the urban centers would be available for hunting.

### **Coal Leasing Suitability Assessment**

Limited development may occur in portions of 14 PRLAs, but these do not overlap with any specially designated Recreation Areas. Expansion of San Juan and La Plata mines would also not be pursued, lessening potential impacts of highly visible mining operations near the urban edges, where recreational use is increasing noticeably.

### **Noise**

#### **Oil and Gas Leasing and Development**

The major cause of noise impacts would be the increased number of wellhead compressors associated primarily with gas operations. With 9,836 new wells projected under Alternative C, and approximately 14,400 existing wells on public land, this could result in 12,100 small wellhead compressors scattered throughout the high development area. Noise from the small wellhead compressors from mechanical parts and exhaust range from 91 to 107 dBA at the source when operating at 100 percent load (Wagner Power Systems 2002).

In addition to the small wellhead compressors, it is estimated that 20 large compressors (2000 to 10,000 HP) and 296 mid-size compressors (500 to 2,000 HP) would be installed under Alternative C. Noise from these compressors, assuming that they are gas-fired, would range from 44 to 69 dBA at a distance of 500 feet and 89 dBA at a distance of 50 feet from the source.

A Noise Policy (Appendix E) would require noise mitigation to be implemented inside the boundaries of 97 designated NSAs in the planning area, and within 300 feet from the noise source near these NSAs, to achieve a sound level of 48.6 dBA over a continuous 24-hour period. This standard must also be met within 100 feet of dwellings and municipal areas. The mitigation requirements would apply to over 206,000 acres with federal minerals, 135,000 acres of which would be in the high development area. **Map 4-2** shows the areas subject to the Noise Policy under Alternative C.

This noise standard is less than the noise generated by the compressors listed above, but actual noise impacts from gas operations would be highly variable, depending on the type of compressor and muffler, location, distribution, and terrain of the compressor sites. Noise impacts would be mitigated near identified golden eagle, ferruginous hawks, and prairie falcon nests in compliance with the FFO raptor noise policy, as described under Alternatives A and B.

Individually, the noise generated by the small compressors may be an annoyance for residents or visitors to the planning area. Also, a significant impact on the human environment could result from the combined noise of many compressors of different sizes in an area. Noise impacts under this alternative would increase as new wells and compressors are added. The impacts would be much greater than under Alternative A because there would be 2,700 more small compressors and 174 more large compressors in use over the 20-year period. Implementation of the Noise Policy established in an NTL to oil and gas operators would

provide localized noise mitigation within and near the designated areas.

### **Land Ownership Adjustments**

If public land becomes non-federal land through disposal or exchange, increasing the non-federal landowners and land users in the high development area, it is possible that there would be additional conflicts over noise, if more people live or recreate in areas interspersed with gas wells. The implementation of the Noise Policy would lessen some of the impacts from oil and gas compressor noise in localized areas.

### **OHV Use**

Noise from OHV use would be less prevalent than under Alternative A because access would be limited to maintained roads in most of the FFO area. Many more maintained roads would be constructed in the high development area, but OHV noise would be short-term with insignificant long-term impacts.

### **Specially Designated Areas**

Under the proposed Noise Policy, there would be 88 specially designated areas that are identified as NSAs. These areas are shown on Map 4-2 with the other NSAs in the planning area.

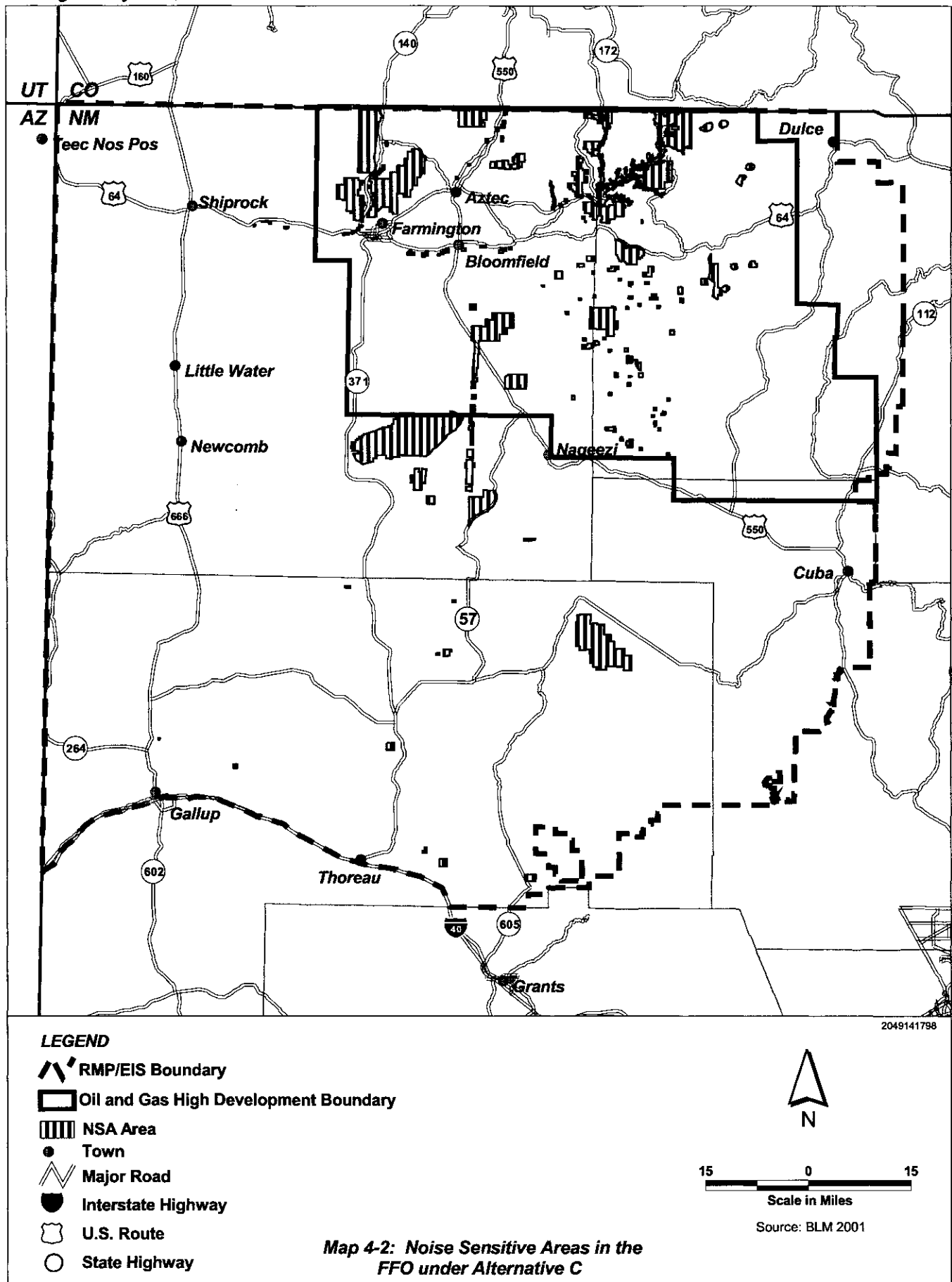
## **Social and Economic Conditions**

### **Employment**

Under Alternative C, based on a total of 9,836 new wells (and about 5,300 at new sites) and reclamation of 4,398 wells per year over the next 20 years. There would be a gain of about 500 jobs per year over current levels at the end of 20 years, resulting in a minor increase of about 6 percent in oil and gas industry job levels.

As recoverable coal is depleted, production at La Plata and San Juan (surface) mine would cease, with a possible loss of about 400 to 450 jobs. Because production from the San Juan Underground mine would replace supply from San Juan surface and La Plata, it is expected





that the San Juan power plant would continue to operate. The loss of 450 direct jobs in the coal industry is regionally insignificant (less than 1 percent of the four-county civilian labor force), but would have local impacts on the tri-cities area and Crownpoint areas, where most of the workers reside. Some of these jobs may be offset by expansion and hiring at the San Juan Underground mine. Later in the planning period, jobs may decline at McKinley mine as well. Under this alternative, because no coal production on FFO land would occur, and there would be no increase from other actions on FFO land, there may be no offset of these job losses. However, other mines may expand, such as the Navajo mine and non-federal interests, providing jobs within the region. Overall, slight gains in fluid mineral jobs would be offset by possible layoffs of coal jobs, for no net benefit to employment and earnings.

### **Expenditures**

Under Alternative C, the estimated cost for drilling 9,836 wells is about \$5.3 billion, at an average cost of \$535,000 per well. Additional direct costs would increase the total investment to about \$6.2 billion. Additional indirect expenditures could result in a total of about \$7.9 billion spent over 20 years, or an average of \$394 million per year (non-escalated). This represents a 230 percent increase in expenditures for oil and gas development on federal land compared to Alternative A. Current expenditures are estimated to be about 11 percent higher than those estimated for this alternative, but these have fluctuated over the last decade in response to market-driven forces.

### **Revenues**

Under Alternative C, the projected oil and gas production volume on federal land over the next 20 years is estimated at 11,125 Bcf. Because oil is a very small percentage of production in the San Juan Basin, these calculations are based on gas values. Assuming a value of \$3.00 per Mcf, the total value of this product could be about \$33.4 billion (in 2001 dollars). Production of federal oil and gas

resources would more than double over current levels over the 20-year planning period, providing for a much higher tax and royalties revenue base for the State of New Mexico. However, any revenues would be dependent on the value of the product.

Under this alternative, changes in coal production on federal land would be minimal in the next 5 years. As the McKinley mine loses production, there could be a decline in coal royalties paid to the state; however, new production is expected to occur within the Four Corners area. Because coal royalties are a relatively small portion of the New Mexico General Fund, compared to oil and gas, these losses would have a minor impact on state revenues.

Grazing could be displaced from land that is used for oil and gas development or where new management prescriptions would withdraw grazing. Under this alternative, the change to the land available for grazing would be modest (about 6 percent of the FFO land), but greater than under Alternative B. New oil and gas development could affect small pieces of many allotments throughout oil and gas fields. A reduction in permitted AUMs would decrease fees paid to the FFO. Changed management prescriptions for several specially designated areas could affect larger areas of contiguous land, potentially affecting some allotments disproportionately. Therefore, impacts may be incurred by a few ranchers, rather than more broadly by small reductions for several ranchers. Slightly reduced cattle numbers would lower the total productive grazing value in the FFO area by about 6 percent. Although the value is small in relative terms, this loss could affect some smaller operators and have a minor negative impact on local cattle ranching.

### **Environmental Justice**

Potential impacts to persons of minority or low-income status would be similar to those described for Alternative A. The oil and gas industry would continue to provide job opportunities, but would still be subject to market fluctuations. The new Noise Policy

would lessen the potential for impacts on land uses and communities throughout the planning area, particularly from development of federal minerals on split estate (including tribal lands). It is likely that a high proportion of workers at San Juan and La Plata mine are Native American or Hispanic. Loss of mining jobs could therefore have a moderate impact on minorities in the local area.

Change in OHV use on federal land under Alternative C may affect access for some persons who are accustomed to cross-country travel and access. This could affect minority or low-income persons who tend to use public lands to some degree for subsistence. For example, wood and plant gathering and hunting may directly supplement other sources for some families. When vehicles are limited to roads and designated trails, it may be less convenient to gather and haul wood. However, the existing road network provides extensive access to nearly all areas; therefore, these uses would continue unless otherwise restricted by management prescriptions.

## **ALTERNATIVE D—BALANCED APPROACH**

### **Surface Disturbance Due to Oil and Gas Development**

The assumptions and methods used to determine impacts are described under Alternative A. The amount of surface disturbance associated with well construction would be 18,393 acres for Alternative D. Surface disturbance associated with large pipelines is assumed to be 11,683 acres. The total amount of surface disturbance associated with future compressor installation (Phase 1 and Phase 2) would be approximately 1,695 acres for Alternative D (Table 4-1).

Subtracting reclaimed acreage of 13,194, the net amount of surface disturbance under this alternative would be 18,577 acres. This does not include plugged and abandoned wells already awaiting approval for reclamation.

### **Watersheds**

Under Alternative D, initial short-term surface disturbance is estimated to total approximately 36,500 acres due to construction of new wells, roads, and small pipelines. As under Alternative A, it was assumed that the majority of the earthmoving for large pipelines and compressors would be located in the high development area in the northern part of the FFO area. The largest anticipated acreage of surface disturbance would occur in the same watersheds most affected under Alternative A: Upper San Juan, Largo, Navajo Reservoir, Carrizo, Animas, La Plata, Blanco, Gobernador, Pump Canyon, Middle San Juan, and Kutz Canyon, in descending order (Table 4-2).

Under this alternative, there would be an increase ranging from 22 to 174 miles of new roads in 11 of the 19 watersheds, resulting in an increase in unpaved roads ranging between 1 and 13 percent in those watersheds. The total increase in new roads would be approximately 805 miles in the planning area (Table 4-3), without taking into account road closures due to P&A wells. This would result in an increase in sediment yield overall, with the largest increases anticipated in the same watersheds that would have the highest surface disturbance from new well locations and pipelines in the center of the high development area.

Most of the soils in the watersheds with the majority of the predicted surface disturbance and new road construction are moderately to highly erodible due to rainfall and surface water runoff. Most of these watersheds are in the low to moderate category for wind erosion. It is likely that significant erosion and sedimentation would be caused by increased initial surface disturbance, which would be reduced once well pads, roads, and pipelines are stabilized by seeding and the establishment of surface water controls.

## **Geology and Minerals**

### **Oil and Gas Leasing and Development**

Implementation of Alternative D assumes that commingling and dual completions would be common. The number of completions allowed on federal land under this alternative would be 9,942 after consideration of stipulations that would limit access to 28 wells. NSO constraints would require 145 directional wells (1.5 percent of all wells on federal minerals) to be drilled to access formations under specially designated areas and Navajo Reservoir. There would be 81,000 acres closed to new leasing. Because 99 percent of the high development area is currently leased, there would be little impact on mineral extraction from lease closure designations.

Because small quarries of less than 5 acres are frequently excavated to supply sandstone and gravel for stabilizing roads to oil and gas wells, it is anticipated that, as the number of new well pads increase, so would the number of quarries in the high development area. Therefore, there would be more quarries constructed under Alternative D than Alternatives A and C, but fewer than under Alternative B. These quarries would be approved with the APDs, or through other BLM permitting procedures, and would be located in areas that avoid impacts to natural and cultural resources.

### **Land Ownership Adjustments**

Under current management over 340,000 acres of public land would be available for disposal, of which approximately 304,500 acres contain federal minerals, mostly located in the areas identified as suitable for coal mining and in the vicinity of the tri-cities area. If this land leaves federal ownership, there would be the potential for complications in extracting these minerals because coordination between the non-federal landowner and the federal mineral manager would be required. Land disposal

transactions would be required to consider impacts to the 6 salable mineral areas.

The potential for conflicts between competing users of the land in the vicinity of the 6 salable mineral areas delineated in Map 2-5 would be similar to that described under Alternative B because the size and location of the disposal areas would be the similar. FFO staff would coordinate land use decisions to avoid limiting access to the 6 salable mineral areas.

### **Specially Designated Areas**

The primary effect on oil and gas development from the designation of special areas would be the limitations on the use of surface resources within their boundaries. Due to NSO constraints within specially designated areas in the FFO, there would be 12 wells that would not be developed and approximately 87 wells that could be developed if directional drilling were used.

Locatable minerals would not be affected by oil and gas development, but would be withdrawn or closed in most of the specially designated areas. There would be little impact on the extraction of locatable minerals, however, because most of these limitations are in specially designated areas that are not in the vicinity of the locatable minerals in the planning area.

### **Coal Leasing Suitability Assessment**

The number of potential conflicts for mineral extraction under this alternative would be similar to that described under Alternative B because the same PRLAs, competitive lease tracts, and Additional Coal Interest areas would be available for new mining.

The areas identified as suitable for coal development after application of most of the unsuitability criteria (378,275 acres) are outside the high development oil and gas area, but conflicts would still have the potential to arise in the Fruitland Formation mineral resources.

## **Soils**

### **Oil and Gas Leasing and Development**

Due to the higher numbers of projected new well locations, roads, and pipelines, this alternative would have more short-term and long-term impacts on soils from oil and gas activity than Alternatives A and C, but less than under Alternative B. Initial short-term surface disturbance from construction of new wells, pipelines, and roads would amount to approximately 36,500 acres. When accounting for the reclamation of P&A well locations and roads, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be approximately 18,600 acres. The resulting impacts to soils would be an increase in soil erosion, but the amount of increase would be determined by the location of the construction on the landscape and the mitigation measures (BMPs) used.

There is the potential for more impacts to prime farmlands due to construction associated with oil and gas development than under Alternative A because the watersheds with the most prime farmland soils are within the high development area for oil and gas. Mitigation measures described under Alternative A could be employed to minimize impacts during site reclamation.

### **OHV Use**

Limited OHV access over most of the FFO area would result in the potential for less damage to soil crusts and vegetation, and thereby less potential for sheet, rill, and gully erosion through enforcement of regulations. Increased soil erosion would be expected to result where OHVs are permitted to ride on existing trails because they would increase soil compaction and further reduce any existing vegetative cover, while preventing its reestablishment. Adding the acreage listed as potentially suitable for open OHV designation listed in Table 2-10 would not result in significant soil impacts because the highly erodible soils and those topographic features with the most fragile biological crusts were

eliminated from consideration. Site-specific evaluations would be conducted before final open designations are made.

### **Coal Leasing Suitability Assessment**

Impacts to soils have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Additional Coal Interest areas. A majority of the potential coal mine areas are located within the Chaco Wash watershed, which would have the greatest chance of being affected if additional coal mining were approved. The majority of this watershed is moderately susceptible to water erosion and high salinity, and has low susceptibility to wind erosion, which would all be accelerated if additional coal mining were started.

Inclusion of BMPs in future coal leases to reduce surface water runoff and erosion would be required to meet state and federal regulations and would minimize accelerated erosion. Prompt revegetation and a weed management plan would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native plant species would be required in seed mixtures under this alternative. Site-specific impacts on soils from new coal leasing would be evaluated in project-specific EAs before issuance of the leases by the BLM.

## **Water Resources**

### **Oil and Gas Leasing and Development**

Under Alternative D, new oil and gas development would result in an increase in net surface disturbance of almost 18,600 acres. Water required for the drilling operations would amount to approximately 7,200 acre-feet, assuming 5,600 barrels per well would be needed.

In general, potential long-term impacts to surface water resources would result from an increase in sedimentation and salt yields due to more surface disturbance than under Alternatives A. Peak runoff rates would increase due to removal of vegetation and compaction of soils on new roads and well pads, but the

impacts of this would depend on the location of the new facilities in each watershed and their distance from drainages, rivers, and other water bodies.

There would be an increase in potential short-term impacts to water resources as a result of sedimentation from the initial increased acreage of surface disturbance during construction. Potential impacts to groundwater could result from infiltration in unlined pits or spills from oil and gas operations. The short- and long-term impacts to surface water and groundwater would be minimized through the use of BMPs and pollution prevention measures as required by federal and state regulations.

#### **Land Ownership Adjustments**

Modification of BLM land ownership would not directly impact water resources. Depending on the modifications implemented, indirect impacts to water resources could result if land management changes due to land transfers. The larger disposal area in the vicinity of the tricity area that would be considered for development could result in an increase in water use in the region, if the land were to be developed for public use.

Potential uses of any land that would be transferred under Alternative D are currently unknown. Therefore, it is not possible to analyze impacts to water resources. When these uses are proposed in the future, subsequent NEPA analysis would be required to determine the specific impacts.

#### **OHV Use**

Because the acreage of open designations for OHVs would be greatly reduced under Alternative D, potential impacts to water resources would be less than under Alternative A. Localized impacts to water resources would continue to occur on lands where cross-country travel is permitted.

#### **Specially Designated Areas**

Alternative D contains more acreage of specially designated areas (649,901) and more restrictive management prescriptions for surface disturbing activities than Alternatives A and B.

Depending on the location of the area, there is a potential to positively affect water resources through improved land management practices and greater restriction of surface disturbance, which would result in improved vegetative cover, protection of soil crusts, reduction in road development, and a resulting minimization of sedimentation. This protection would be provided in 43 percent of the public land in the FFO area. In situations where OHV cross-country travel would be permitted within a specially designated area, a localized negative impact to water resources could result.

#### **Coal Leasing Suitability Assessment**

Impacts to surface water and groundwater quantity and quality have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Additional Coal Interest areas. A majority of the potential coal mine areas drain to the Chaco River, which would have the greatest chance of being affected if new coal mining were approved.

Clearances for all resources, and installation and maintenance of BMPs to reduce surface water runoff and erosion, would be required for both commercial mines and those for home fuel use, according to BLM policy to meet state and federal regulations. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species would be required. The site-specific potential impacts from new coal leases would be evaluated in project-specific EAs before approval would be granted by the BLM.

#### **Air Quality**

##### **Oil and Gas Leasing and Development**

Alternative D proposes to develop 9,942 new gas wells on federal lands, which would produce approximately 11,002 Bscf of gas over the 20-year period of analysis. This production rate is nearly identical to the production rate estimated for Alternative B. Emissions from gas production and resulting ambient air quality impacts would be nearly identical to those for Alternative B.

**OHV Use**

Proposed OHV usage under Alternative D and its resulting air quality impacts would be somewhat less than for Alternative A, due to limitations on cross-country travel.

**Coal Leasing Suitability Assessment**

Coal mining can result in the generation of fugitive dust and equipment emissions that have the potential to affect air quality. If new mines are opened as old ones are reclaimed, no new significant impacts to air quality would be anticipated beyond current conditions. If increased acreage of coal mines are approved, impacts on air quality may occur. When site-specific locations of new coal mines are known, EAs would be developed to analyze the impacts and mitigation measures may be identified in the permitting process.

**Upland Vegetation****Oil and Gas Leasing and Development**

The amount of long-term vegetation disturbance within the planning area for new wells, roads, pipelines, and compressors on public land would be almost 32,000 acres. Initial short-term surface and vegetation disturbance during construction would affect 10,300 acres, which would be reseeded once regular operations begin. The specific locations of the new wells and other facilities are not known but most would be constructed in the high development area containing primarily piñon-juniper woodlands and Great Basin Desert Scrub plant community types. Areas that are reseeded would not return to their original plant cover types in the 20-year period considered. Developers would be encouraged to use existing road and pipeline ROWs to minimize additional disturbance.

The increased surface disturbance and vehicle traffic would increase the spread of noxious weeds. Weed management plans would need to be developed and implemented to minimize this problem and protect native vegetation.

**Land Ownership Adjustments**

Over 340,000 acres of public land would be available for possible disposal under Alternative D (Table 2-1) in most of the same areas as those described for Alternative B. The disposal of land could have negative effects on upland vegetation if land disturbance activities were to take place, similar to that described for Alternative B. An estimated 178,000 acres would be available for acquisition (Table 2-1), more than would be available for Alternatives A and B, and less than under Alternative C. This would result in an increased potential for positive impacts to upland vegetation relative to Alternatives A and B. This has the potential to result in a beneficial impact on upland plant communities, especially if the land were acquired in support of a resource program because vegetation-disturbing activities would be limited and localized on the acquired acreage. Weed management plans would be developed and implemented on the acquired acreage.

**OHV Use**

Most FFO land would be designated as limited, requiring that OHVs stay on maintained roads unless otherwise designated open or closed (Table 2-3). The acreage of closed areas would be greater than under Alternatives A or B and less than under Alternative C (Table 2-2), OHV use of 2-track roads or trails would be allowed in designated areas, and additional areas would be considered for open designations in several OHV management units in the future through the appropriate land use planning process. The potential for OHV traffic to degrade upland plant community types would be less than under all but Alternative C.

**Specially Designated Areas**

There would be limitations on surface occupancy for oil and gas, restrictions on mineral access, and more limited OHV access within specially designated areas under Alternative D than under the current management. There would be more acreage within these areas than under Alternatives A

and B, so the limitations on land use, such as vegetation-disturbing activities, OHV access, and grazing would be applied to more public land within the FFO area than under current conditions, resulting in the potential for improved vegetative cover in approximately 45 percent of the public land in the FFO. If inholdings are acquired within specially designated areas, weed management would be more successful on consolidated blocks of public land.

### **Coal Leasing Suitability Assessment**

Specific locations of new coal mine areas on FFO land have not been identified. Coal leases would be considered on 378,000 acres that remain after preliminary application of the unsuitability criteria. Proposed coal mining locations would be evaluated through application of the coal screens and unsuitability criteria, as well as analysis of the proposed project impacts on upland vegetation through the NEPA process, once site-specific locations are known and before approval of mining would be granted. All coal mines, commercial and home fuel, would be reclaimed and revegetated. Weed management plans would be required to minimize the spread of noxious weeds.

### **Riparian Areas and Wetlands**

#### **Oil and Gas Leasing and Development**

The only specific constraints on oil and gas development that would protect riparian areas are the NSO constraints within the active floodplain and CSU constraints in the 100-year floodplain of the Ephemeral Wash Riparian Area, and CSU constraints within the rest of the approximately 10,000 acres of public land in the River Tracts and Ephemeral Wash Riparian Areas. There are other riparian areas within the planning area that could be affected by oil and gas development through surface disturbance, construction, and removal of vegetation. There would be an increased potential for roads and pipelines to traverse arroyos, but developers would be encouraged to use existing road and

pipeline ROWs to minimize additional disturbance.

While it is impossible to quantify the impacts to riparian areas without knowing the actual locations of well, road, pipeline, and compressor sites, it is anticipated that there would be impacts to riparian areas from wells to be installed in the high development area. The impacts would be less than under Alternative B and more than under Alternatives A and C. Any construction along the edge or across water bodies and wetlands would be required to meet state and federal requirements for sediment and erosion control, and the developers could be required to obtain permits from the USACE and the NMED in compliance with Section 404 of the CWA and Section 401 of the NMWQCA.

#### **Land Ownership Adjustments**

Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes. Designated FFO riparian areas such as the River Tracts and Ephemeral Wash Riparian Areas would not be included in land being considered for disposal, so no impact to these areas would result.

#### **OHV Use**

OHV use of the River Tracts and other protected riparian areas on FFO land would be limited to designated roads and trails, and intermittent washes (Table 2-3), so the potential for negative impacts to riparian areas and washes from OHV use would be greater than under Alternative C and less than under Alternative A, as long as the limitations are enforced.

#### **Specially Designated Areas**

The addition of the Ephemeral Wash Riparian Area and maintenance of the River Tracts Riparian Area would increase protection of riparian areas within the FFO. CSU constraints in other specially designated areas within the FFO would assist managers in



avoiding riparian and wetland areas because they can require that oil and gas operations be moved in order to minimize impacts to specific resources. The areas with closed designations for OHV use would also help to limit damage to riparian and wetland areas that may be within their boundaries.

### **Coal Leasing Suitability Assessment**

Coal mining would not take place in significant wetland and riparian habitat because these areas would be screened out during the application process. There is the potential that coal mining could lead to increased erosion and resulting sedimentation in riparian areas. Coal mining has the potential to directly affect arroyos, and permits and associated BMPs for activities that could affect waterways and wetlands may be required. The potential for this impact would be assessed in a project-specific NEPA document once the exact location of the mining application is known. It is not anticipated that coal mining would significantly affect riparian areas due to requirements for mitigation and pollution prevention, but site-specific analysis would be required once a location has been requested for consideration before this could be accurately addressed.

### **Special Status Species**

#### **Oil and Gas Leasing and Development**

Implementation of Alternative D would be expected to affect the same special status species as those described under Alternative A. It is estimated that 9,942 new wells would be developed under this alternative over the next 20 years, resulting in the disturbance of almost 36,500 acres of land with federal minerals (Table 4-2). This would be an increase in disturbed land over Alternative A, and a decrease from the acreage under Alternative B. Most of this disturbed land would be in the high development area, which is principally in the piñon-juniper woodlands and Great Basin Desert Scrub habitats.

Consultation has been initiated with the USFWS for this alternative and a biological assessment is being prepared. BLM's

preliminary findings are that oil and gas development under Alternative D may affect but would not adversely affect listed and proposed species or designated critical habitat.

Because specific protocols and surveys would not be required, other special status fauna could be negatively affected in the high development area by increased habitat fragmentation and human activity, but the degree of effect is unknown. Although the amount of habitat fragmentation cannot be determined because the exact location of the new wells and associated facilities is not known, they would be concentrated in areas already fragmented from oil and gas development. The gray vireo, for example, seems to have adapted to current levels of fragmentation of its habitat, but there may be a threshold of habitat fragmentation and disturbance for this and other species beyond which population declines become evident.

Avoidance of special status plants would be required so no impacts would be anticipated. Oil and gas developers would be required to conduct surveys for the Aztec gilia and Brack's cactus. If the plants occur in the planned area of development, the proposed facilities would be moved to avoid them.

The BLM would continue to manage non-federally listed species with the goal of contributing to the conservation of these species to reduce the potential for their being listed under the federal ESA.

#### **Land Ownership Adjustments**

The amount of land that would be made available for disposal in the tri-cities area is similar to that under Alternative B, although the total acreage listed for disposal would be less. The land in the tri-cities area typically consists of degraded habitat in close proximity to human activity, and is therefore considered marginal habitat. No federally listed or proposed species or their critical habitat are known to occur in land being considered for transfer. Few, if any, other special status species would occur in this disposal area. Occasional migrating ferruginous hawks may occur in this

area, and loggerhead shrike and burrowing owl have the potential to nest in the area. Surveys for selected special status species would be required before any land transfer could be completed, with mitigation or avoidance required as necessary. Therefore, federally listed and proposed species and their potential habitat would not be directly affected.

### **OHV Use**

The amount of land open to OHV use under Alternative D would be 4,616 acres. The majority of FFO land would be closed or limited for OHV use. The open designation would be much less than under Alternative A, so the potential for impacts to special status species from cross-country travel would be much less, even if some additional acreage would be designated as open in the future (Table 2-4). It is possible that OHV access could affect special status species until their existence and habitat are identified by FFO staff during surveys and placed on the conflict map maintained at the FFO.

### **Specially Designated Areas**

The modifications and additions of specially designated areas to protect special status species described under Alternative B would also be proposed under Alternative D. The Ephemeral Wash Riparian Areas would provide protection to potential habitat for the southwestern willow flycatcher. Similarly, habitat management practices for the proposed Mexican Spotted Owl ACEC would provide protection for this species.

### **Coal Leasing Suitability Assessment**

The development of land suitable for coal mining under Alternative D has little or no potential to affect federally listed species or designated critical habitat. Knowlton's cactus occurs near Navajo Reservoir, outside the location of the PRLAs, competitive lease tracts, and Additional Coal Interests. The Mesa Verde cactus and Mancos milkvetch are within the Hogback ACEC, which would not permit coal mining. Potential Colorado pikeminnow, razorback sucker, and southwestern willow

flycatcher habitat, as well as federally designated pikeminnow critical habitat along the San Juan River in the River Tracts Riparian Area, would not be affected if coal mining were approved because these areas would be eliminated through application of the unsuitability criteria. The Bald Eagle ACEC units and the Mexican spotted owl potential and federally designated critical habitats on FFO land are also not close to potential coal mining areas.

The mountain plover is a federal proposed species that may occur in the area of potential coal mining (Map 4-1). Many of the PRLAs, competitive lease tracts, and Additional Coal Interests occur near or within plover potential habitat. Applications to mine coal (commercial and for home fuel use) in and near potential mountain plover habitat would require plover surveys to be completed before they would be approved. In addition, consultation with the USFWS would be required when site-specific applications to mine coal on FFO land are received, in compliance with the Fish and Wildlife Coordination Act.

Proposed coal mining would go through the NEPA process and an analysis of the proposed project impacts on special status species would be performed when site-specific locations are considered. Clearances would be required and site reclamation would be conducted once mining is completed.

### **Fisheries and Wildlife**

#### **Oil and Gas Leasing and Development.**

Implementation of the conservation alternative would not be expected to have an impact on fisheries or other aquatic resources for the reasons discussed under Alternative A, Fisheries and Wildlife.

An estimated 2,700 wells would be developed in the 397,000-acre study area under Alternative D, and the construction of these wells and associated roads would result in the long-term loss of almost 8,600 acres of habitat. The long-term loss of habitat from existing and projected development would be

over 27,000 acres or 6.9 percent of the area. An estimated 220 miles of new roads would be constructed, which would result in an increased of road density from 2.6 to 3.0 mi/mi<sup>2</sup>. Additional functional habitat loss within 660 feet of roads could be as much as 35,200 acres; 70,400 acres within 1,320 feet. This represents an increase from 46 to 52 percent functional habitat loss within 660 feet and 75 to 88 percent within 1,320 feet of roads. This estimated increase in functional habitat loss is likely to be overestimated due to overlap in those fragmented habitat areas.

The estimated number of new wells and roads and associated functional habitat loss under Alternative D would be slightly greater than under Alternative C in the entire planning area, but the same within the 397,000 acres of wildlife habitat. Of the 397,000 acres used to assess the impacts of oil and gas development on wildlife, 297,000 acres of public land would be included in 9 Wildlife Areas (Map 2-6) to be managed for big game and other wildlife through timing limitations on oil and gas development activities in the winter and spring, vegetation management, and other measures. Potential habitat loss and fragmentation in the pronghorn antelope habitat in the Angel Peak Wildlife Area would be similar to that described under Alternative C.

Habitat loss and fragmentation would be likely to further reduce the carrying capacity for wildlife although the exact level of this reduction cannot be quantified for the same reasons given under Alternative A. The impacts on mule deer, elk, pronghorn antelope, and other wildlife would be slightly more than those described under Alternative C, and could result in a reduction of the wildlife populations in the planning area as compared to Alternative A.

Other species of wildlife would be affected by oil and gas development under this alternative, including the displacement of breeding birds. Assuming 100 pairs of breeding birds per 100 acre, the loss of almost 8,600 acres of public land in the 397,000-acre area could result in the long-term loss of habitat for an equal number of pairs of breeding birds.

Many of the breeding birds in this area use the piñon-juniper woodlands and Great Basin Desert Scrub habitats, and most of this habitat would not be replaced for a long time after well pad reclamation.

The number of new wells and roads on USFS and AFO lands would be the same as under Alternative C. More wells (approximately 140) would be developed on USBR land than under Alternatives A and C, but less than under Alternative B. New wells and roads would result in the long-term loss of an estimated 1,680 acres in the CNF, 200 acres on USBR land, 30 acres on the SFNF, and 2,500 acres on AFO land. Many of the same species that were assessed above for the FFO area also occur on other federal lands. It is believed that the impacts of Alternative D on wildlife in these areas would be less than on FFO land due to the lower levels of oil and gas development and associated habitat disturbance.

#### **Land Ownership Adjustments**

The amount of public land that would be available for disposal under this alternative would be over 340,000 acres (Table 2-1), more than under Alternatives A and C and less than under Alternative B. More land would be considered for acquisition than under Alternative A because there would be more land within specially designated areas for which acquisition of inholdings would be a priority. This has the potential to have greater positive impacts on wildlife than under Alternatives A and B, especially since more of the land to be acquired would be within the better wildlife habitat areas in the FFO.

#### **OHV Use**

The amount of land open to OHV use under Alternative D would be 4,616 acres, with the possibility that more could be designated as open in the future (Table 2-4). The majority of FFO land would be closed or limited for OHV use. The open designation would be much less than under Alternative A, so the potential for impacts to wildlife from cross-country travel would be much less.

**Specially Designated Areas**

Wildlife management, particularly for big game, would be expanded under this alternative (as compared to current management) to include 297,000 acres of public land in Cereza Canyon, Crow Mesa, East La Plata, Ensenada Mesa, Gonzales Mesa, Laguna Seca Mesa, Middle Mesa, Rattlesnake Canyon, and Rosa Mesa Wildlife Areas, as well as Ephemeral Wash Riparian Area. Within the Laguna Seca Mesa Wildlife Area would be the Mexican Spotted Owl ACEC. The land within these wildlife areas support resident and wintering herds of deer, elk, and antelope, a viable population of wild turkey, and other wildlife, as noted in Table 2-5 under the management prescriptions for each Wildlife Area. Constraints such as TLs in the 9 Wildlife Areas would reduce the potential impacts of oil and gas operations and other human activities on wildlife.

**Coal Leasing Suitability Assessment**

Specific locations of new coal mining areas on FFO land have not been identified. Coal mines would not be located within the best wildlife areas. Proposed coal mining would go through the NEPA process and site-specific analysis of the proposed project impacts on upland wildlife habitat would be performed at that time.

**Wilderness**

In general, impacts on the WA and WSAs would be generally similar as those describe for Alternative C.

Potential development of coal leases and interests and PRLAs (depending on adjudication) on land surrounding the WA and Ah-shi-sle-pah WSA could have similar indirect impacts as described for Alternative B. Unsuitability criteria screening would reduce potential for direct impacts of mining within these areas.

**Rangeland****Oil and Gas Leasing and Development**

The impacts under this alternative would be similar to those under Alternative C, with slightly greater acreage of forage removed by oil and gas development in the high development area.

**Land Ownership Adjustments**

The impacts of land disposal under Alternative D would be similar to those but slightly less than under Alternative B because the 3-mile area near the tri-cities area would be a priority for land transfer.

**OHV Use**

Impacts on rangeland under this alternative would be similar to Alternative C.

**Specially Designated Areas**

Grazing limitations in specially designated areas would affect over 25,000 acres in 31 areas. Most grazing permits in 4 areas would not be reissued if they expire. Acquisition of inholdings in these areas would be a priority, so grazing allotments in the areas where grazing permits remain would consist of more contiguous land than under Alternatives A and B.

**Coal Leasing Suitability Assessment**

Impacts on rangeland and grazing permits from additional coal mining would be the same as that described for Alternative A.

**Lands and Access**

Impacts on lands and land use from this alternative would generally be similar to Alternative C.

**Oil and Gas Leasing and Development**

Oil and gas development would generally be similar to Alternative C. Disturbance, displacement and new road construction from 9,942 new wells (involving about 5,370 new locations) would be similar in extent to Alternative C. The Noise Policy under this alternative would provide similar standards to adjacent uses on non-public land for residential,

community uses, cemeteries, parks, and other noise sensitive uses. The Noise Policy would apply for a combination of 13 defined areas and 42 point locations. This would provide standards for somewhat less acreage than the FFO but would apply to most sensitive locations.

Oil and gas-related traffic on regional and gas field roads is estimated to be similar to current levels (with a possible slight reduction based on new well development), but about 20 percent higher than projections for Alternative A. However, industry traffic has fluctuated in response to production demands. Over the long-term, industry-related traffic would be similar to Alternative C, and could contribute to higher traffic and changes in traffic flow on some roads. Temporary impacts during construction to ongoing land uses would be similar to Alternative C.

Impacts from oil and gas development on access within the planning area would be similar to Alternative C. A net increase in roads of 1 percent would have minimal effect on access.

#### **Land Ownership Adjustments**

The land disposal area would be similar to Alternative C, with the addition of land between Aztec and Bloomfield. This would provide a mixture of benefits by augmenting urban land supplies, and keeping valuable open space for recreation. Retention of federal mineral ownership would cause additional split estate, having the same effect as described for Alternative C.

#### **OHV Use**

OHV access would be similar to Alternative C, with slightly more access allowed off roads for special or exceptional uses. Also, consideration of some suitable areas for cross-country travel during development of OHV management unit plans could benefit access in some areas.

#### **Specially Designated Areas**

Provisions for and changes in specially designated areas would be similar to Alternative

C, with somewhat less land designated for wildlife values. BLM would acquire a slightly larger area (178,237 acres) of inholdings within specially designated areas than under Alternatives A and B, potentially increasing the total managed areas by 50 percent. Accounting for proposed acquisitions, expansion of some areas, and new designations, specially managed land could increase by 75 percent over current conditions. Effects of acquisitions on public land management would be the same as described for Alternative A.

#### **Coal Leasing Suitability Assessment**

Future development of competitive lease tracts, and other coal interests, particularly in the Lee Ranch/Hospah area and the BHP interests near La Plata and San Juan mines would be likely. Impacts on lands and land uses would be similar to those described under Alternatives A and B. All coal mines, commercial and home fuel, would be required to be reclaimed when completed. Impacts from continuing home fuel collection would be the same as Alternative A.

#### **Visual Resources**

##### **Oil and Gas Leasing and Development**

The level of oil and gas development projected for this alternative is similar to Alternative C. The potential impact to characteristic landscapes would be the same as described for Alternative C.

Impacts from oil and gas wells on USBR land would be greater than Alternative C and less than under Alternative A. On USFS land, proposed practices would tend to be protect visual conditions and impacts would be similar to Alternative C.

##### **Land Ownership Adjustments**

Land adjustment policies under this alternative would favor acquisition of inholdings in specially designated areas and potentially would increase management of visual resource values in areas with potential value. This would benefit visual resources. Disposals in the tri-cities area would not be expected to affect prime visual resources in the

FFO area, so little impact to visual resources would result.

### **OHV Use**

Impacts on visual resources would be similar to those described under Alternative B.

### **Specially Designated Areas**

Under Alternative D, management of FFO lands for VRM objectives would be similar to Alternative A. The amount of land managed for VRM I and II objectives would increase to almost 16 percent. This is slightly higher than for Alternative B, and slightly less than for Alternative C. This moderate increase would benefit conservation of visual qualities in the areas with highest value.

### **Coal Leasing Suitability Assessment**

This alternative would protect Ah-shi-sle-pah WSA from future coal development and preserve the outstanding visual quality of the area. Expansion of San Juan mine and development of a new mine on any of the competitive lease tracts or coal interests could cause highly visible surface disturbance. Mines for home fuel use would cause minimal visual impact. According to an industry study, development of coal interests around Lee Ranch and Hospah are most likely. Most of these areas have VRM Class III or IV ratings and would allow moderate or fairly extensive modification. However, specific locations may be in the viewshed of many sensitive cultural sites and areas with high visual value. Impacts from new mine development would be similar to those described for Alternative A.

### **Cultural Resources**

#### **Oil and Gas Leasing and Development**

This alternative would affect approximately 1,895 archaeological sites in the same watersheds as the other alternatives (Table 4-10). The 805 miles of new roads in the high development area would provide new public access to archaeological sites and TCPs, potentially increasing vandalism.

### **Land Ownership Adjustments**

None of the significant known cultural sites and TCPs would be included in disposal parcels. Acquisition of inholdings would benefit cultural resources within specially designated areas because sites would be protected by a single land owner (FFO) and a comprehensive management plan.

### **OHV Use**

OHV access would be limited to maintained and graded roads in most of the FFO area, so there would be less potential than under Alternatives A and B for archaeological sites to be damaged by vehicles driving across the landscape. If additional areas were to be designated as open for cross-country travel, cultural resources surveys would be required and clearances would be issued before the areas would be approved.

### **Specially Designated Areas**

Special protection from such uses as oil and gas activities, mineral entry, land disposal, vegetation management, and OHV activities would be provided to important cultural sites in 79 specially designated areas within approximately 78,700 acres in the FFO area. The Noise Policy would require mitigation of noise either within the boundary or from important cultural sites within 34 cultural ACECs.

### **Coal Leasing Suitability Assessment**

When specific locations of proposed coal mines are known, cultural resource clearance for commercial mines or home fuel use would be required before approval. Any archaeological sites or TCPs that are found would be avoided or mitigated. Clearance, avoidance, and mitigation would also be required before mining coal for home fuel use. Therefore, impacts to cultural resources would either be minimized during the approval process, or sites would be documented through mitigation before coal mining would begin.

## **Paleontology**

### **Oil and Gas Leasing and Development**

Alternative D would involve less acreage of surface disturbance and therefore result in fewer impacts to paleontological resources than under Alternative B, but more than under Alternatives A and C. CSU constraints would limit oil and gas development impacts to paleontological resources within 9 specially designated areas, resulting in more protection than would occur under the 4 areas in Alternative A.

### **Land Ownership Adjustments**

Impacts to paleontological resources would be the same as under Alternative B.

### **OHV Use**

Impacts to paleontological resources would be the same as under Alternative B.

### **Specially Designated Areas**

By proposing 5 new paleontological areas, more paleontological resources would be protected under this alternative than under Alternative A. Over 135,000 acres of public land containing known important formations would be protected through the implementation of management prescriptions within 9 specially designated areas. This includes approximately 135,000 acres of public land within Bettonie Tsosie, Bohanon Canyon Complex, Carson Fossil, Fossil Forest, Gobernador and Cereza, Kutz Canyon, Lybrook Fossil, Piñon Mesa Fossil, and Torrejon Fossil Fauna Paleontology Areas.

### **Coal Leasing Suitability Assessment**

An inventory of paleontological resources would be required prior to mining, as well as documentation or collection of vertebrate specimens uncovered during mining, in compliance with an agreement between the BLM and the State of New Mexico. This documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing them from their original context. More areas are under consideration for coal

mining. Consequently, there could be the potential for additional impacts if additional coal mining were to be approved in areas where unidentified paleontological resources occur.

## **Recreation**

### **Oil and Gas Leasing and Development**

Impacts from development of 360 new wells under Alternative D in expanded recreation areas would be similar to those described for Alternative C. With up to 12,500 new small compressors and 320 large compressors located throughout the FFO, there may be several locations affected by noise. The Noise Policy under this alternative would designate some recreational sites by point locations rather than an inclusive area. Less land would be protected from potentially undesirable noise levels from well site compressors. However, the policy provides for the 48.6 dBA level or lower at key locations, trails, campgrounds and recreational sites with specified buffer areas. Specific recreational resources would benefit from the Noise Policy proposed under this alternative, but most of the FFO could be affected by widespread noise sources. This could degrade the quality of the area for dispersed recreation.

### **Land Ownership Adjustments**

Impacts of land adjustments under Alternative D would be similar to Alternative C. The BLM would be more open to land disposal in the tri-cities area, but would continue to review R&PP Act applications for consistency with BLM objectives and identified community interests, particularly for outdoor recreational facilities for motorized and un-motorized vehicles.

### **OHV Use**

OHV classifications and impacts on recreational use of OHVs would be similar to those described for Alternative B, with somewhat less land (about 66,000 acres) being potentially suitable for open OHV designation after further planning is pursued. Other discrete areas would be available for specific

recreationist activities such as controlled OHV use in Angel Peak Recreation Area, as well as wash bottoms and more trails designated for specific one- or two-track uses.

### **Specially Designated Areas**

Recreation management areas would increase by 42.4 percent over current (the same as Alternative C), benefiting recreational resources in the FFO. ROS classifications would be essentially the same as Alternative C. More areas would be available for hunting and shooting access than under Alternative C.

### **Coal Leasing Suitability Assessment**

Expanded coal development in the vicinity of San Juan mines would generally limit the desirability of the immediate area for recreation. Potential impacts to the proposed Piñon Mesa Trail Recreation Area could be the same as under Alternative B. Potential development in the south part of the FFO would have less potential to affect recreation. However, several cultural sites also provide for public visitation and may be affected by altering the context of cultural resources (from oil and gas and coal development). Overall impacts on dispersed recreational opportunity would be minimal. Coal development would not occur in the WA or WSA, benefiting opportunities for the most primitive and remote recreational experiences.

### **Noise**

#### **Oil and Gas Leasing and Development**

The major cause of noise impacts would be the increased number of wellhead compressors associated primarily with gas operations. With 9,942 new wells projected under Alternative D, and 14,400 existing wells on public land, this could result in almost 12,200 small wellhead compressors scattered throughout the high development area. Noise from the small wellhead compressors from mechanical parts and exhaust range from 91 to 107 dBA at the source when operating at 100 percent load (Wagner Power Systems 2002).

In addition to the small wellhead compressors, it is estimated that 20 large

compressors (2000 to 10,000 HP) and 299 mid-size compressors (500 to 2,000 HP) would be installed under Alternative D. Noise from these compressors, assuming that they are gas-fired, would range from 44 to 69 dBA at a distance of 500 feet and 89 dBA at a distance of 50 feet from the source.

A Noise Policy (Appendix E) would require noise mitigation within 400 feet of the noise source to be implemented inside the boundaries of 16 designated NSAs, and within a specified distance from receptor points in 45 additional NSAs, to achieve a sound level of 48.6 dBA over a continuous 24-hour period. This noise standard would also be required within 100 feet of dwellings and municipal areas. The acreage to be submitted to noise mitigation would be less than the acreage under Alternative C, but it is not measurable until FFO staff identify the locations of receptor points and the distance from each point that is subject to Noise Policy.

This noise standard is less than the noise generated by the compressors listed above, but actual noise impacts from gas operations would be highly variable, depending on the type of compressor and muffler, location, distribution, and terrain of the compressor sites. Noise impacts would be mitigated near identified golden eagle, ferruginous hawks, and prairie falcon nests in compliance with the FFO raptor noise policy, as under Alternatives A and B.

Individually, the noise generated by the small compressors may be an annoyance for residents or visitors to the planning area. Also, a significant impact on the human environment could result from the combined noise of many compressors of different sizes in an area. Noise impacts under this alternative would increase as new wells and compressors are added. Potential impacts would be much greater than under Alternative A because there would be 2,760 more wellhead compressors and 177 more large compressors in use over the 20-year period. Implementation of the Noise Policy established in an NTL to oil and gas operators would provide localized noise mitigation within and near the designated areas.



**Land Ownership Adjustments**

If public land becomes non-federal land through disposal or exchange, increasing the non-federal landowners and land users in the high development area, it is possible that there would be additional conflicts over noise, if more people live or recreate in areas interspersed with gas wells. The implementation of the Noise Policy would lessen some of the impacts from oil and gas compressor noise in localized areas.

**OHV Use**

Noise from OHV use would be less prevalent than under Alternative A because access would be limited to maintained roads in most of the FFO area. Many more maintained roads would be constructed in the high development area, but OHV noise would be short-term with insignificant long-term impacts.

**Specially Designated Areas**

Under the proposed Noise Policy, noise mitigation within and around 16 specially designated areas and 45 areas with designated receptor points within them. The noise policy to protect nesting raptors would continue to minimize impacts.

**Social and Economic Conditions****Employment**

Employment in the oil and gas industry under this alternative would be similar to Alternative C. Regional changes in employment in the energy extractive industries would be minimal. There would likely be no loss of coal mining jobs under this alternative, as there would be under Alternative C. This would therefore minimize potential for local impacts on coal mining-dependent labor pools. Overall, there would be a slight gain in job levels in extractive industries, but these would represent minimal increases for the planning area as a whole.

**Expenditures**

Expenditures under Alternative D would be similar to Alternative C and current

expenditures for the oil and gas industry. The estimated cost for drilling 9,942 wells is \$5.3 billion, at an average cost of about \$536,000 per well. Additional direct costs would increase the total investment to about \$6.2 billion. Additional indirect expenditures could result in a total of \$7.9 billion spent over 20 years, or an average of \$399 million per year (non-escalated). This represents 130 percent increase in expenditures for oil and gas development on federal land compared to Alternative A and about 10 percent less than if current levels were maintained.

**Revenues**

Impact on tax revenues and royalties from oil and gas development would be essentially the same as under Alternative C. Over 20 years, production potential could more than double in the FFO area.

Under this alternative, coal production from existing mines on federal land may decline by 50 percent over the next 20 years. However, this could be offset by expanding deep leases at San Juan and La Plata mines. The resulting impact on coal royalties and taxes is not known, but would likely be minor, considering that coal revenues are currently only 5 percent of energy extractive industry revenues in New Mexico.

Impacts on grazing would be similar to Alternative B. Like Alternative C, the reduced acreage would reflect changed management prescriptions and therefore affect larger areas of contiguous land, which could affect some allotments disproportionately. Therefore, impacts may be incurred by a few ranchers, rather than more broadly by small reductions for several ranchers. A slight reduction (about 3 percent) in permitted AUMs would somewhat decrease fees paid to the FFO and productive value of grazing. Although the value is small in relative terms, this loss could affect some smaller operators and may have a minor negative impact on local cattle ranching.

### **Environmental Justice**

Impacts on minorities and low-income persons would be generally similar to those described for Alternative A. There would be no projected job losses; therefore, potential impacts on minority workers from loss of coal mining jobs under Alternative C would not result.

Change in OHV use on federal land under Alternative D may affect access for some persons who are accustomed to cross-country travel and access. This could affect minority or low-income persons who tend to use public lands to some degree for subsistence. For example, wood and plant gathering and hunting may directly supplement other sources for some families. When vehicles are limited to roads and designated trails, it may be less convenient to gather and haul wood. However, the existing road network provides extensive access to nearly all areas; therefore, these uses would continue unless otherwise restricted by management prescriptions.

### **CUMULATIVE IMPACTS**

The analysis of cumulative impacts focuses on the extent to which impacts from each alternative could combine with impacts from past, present, and future actions to create a significant adverse impact in the planning area. Past and present impacts are reflected in the existing conditions in the San Juan Basin in New Mexico. Analysis of future impacts includes the following considerations.

- The cumulative impacts identified in the RFDS for development of oil and gas on all land and from all mineral ownership types within the planning area, including the FFO area, AFO area, USBR lands around Navajo Reservoir, USFS lands in Carson and Santa Fe National Forests, Indian land, and state and private land.
- The cumulative effects of implementing the proposed changes to land use management in the FFO area in

combination with other reasonably foreseeable actions.

This analysis is more general than the analysis of direct and indirect impacts because decisions about other actions in the planning area would be made by many public and private entities, and the location, timing, and magnitude of these actions are not well known.

### **Surface Disturbance Due to Oil and Gas Development**

The predicted acreage of future disturbance due to oil and gas development on non-federal minerals under each alternative was combined with the existing amount of disturbance to estimate cumulative surface disturbance associated with oil and gas development in the planning area. The 1991 Oil and Gas Leasing and Development Amendment (BLM 1991a) estimated the impacts of an additional 4,512 wells as 28,750 acres at that time. However, those numbers have been exceeded and disturbance incurred prior to this amendment was not quantified in that document. Abandoned locations that are waiting for reclamation approval currently contribute to the total area of surface disturbance not associated with active wells. Specific data describing current surface disturbance are not available, so a broad estimate was made by adding the predicted amount of surface disturbance associated with each alternative to an estimate of the disturbance associated with approximately 18,000 active wells in the New Mexico portion of the San Juan Basin, using the same assumptions as described at the beginning of this chapter. The 3-acre average for well pads was used, and estimates for large pipeline and compressor construction were scaled in proportion to the amount of disturbance predicted in the RFDS. The resulting amount of long-term surface disturbance associated with current facilities producing federal minerals is broadly estimated at approximately 83,500 acres.

The RFDS projects a total of 12,461 wells to be developed over 20 years in the San Juan Basin (assuming 25 percent dual completions

and commingling), of which 80 percent would be constructed to extract federal minerals. The cumulative impacts from the additional 2,491 wells that would be developed on non-federal minerals, was estimated assuming the same rate of commingling and dual completions as described for federal minerals. Based on the assumptions used to calculate surface disturbance for new wells and associated facilities, described under Assumptions for Analysis at the beginning of Chapter 4, there would be approximately 8,300 acres of long-term surface disturbance from construction of well pads, 80 large compressors, and large pipelines.

The net acreage of surface disturbance associated with projected new oil and gas development under Alternative D on all mineral ownership in the San Juan Basin would be almost 27,000 acres, as shown in **Table 4-18**. In combination with current surface distur-

bance, there would be approximately 110,400 acres or 4.8 percent of the land in the high development area (1.3 percent of all land) that would be affected by oil and gas construction within the New Mexico portion of the San Juan Basin.

Development of federal and non-federal minerals under Alternative A would result in long-term disturbance of approximately 9,300 acres. In combination with current surface disturbance, there would be almost 92,800 acres or 4 percent of the land in the high development area (1.1 percent of all land) disturbed. Under Alternative B, almost 117,000 acres or 5 percent of the land within the high development area (1.4 percent of all land in the planning area) would be affected when adding current and projected new oil and gas development. Alternative C would result in nearly the same acreage of long-term surface disturbance as Alternative D.

**Table 4-18. Net Surface Disturbance from Oil and Gas Development on All Mineral Ownership**

Surface Disturbance	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
New Development on Federal Minerals	934	24,781	18,238	18,577
New Development on Non-Federal Minerals	8,353	8,353	8,354	8,354
<b>Subtotal of New Development</b>	<b>9,287</b>	<b>33,134</b>	<b>26,592</b>	<b>26,931</b>
Existing Surface Disturbance	83,500	83,500	83,500	83,500
<b>Total Surface Disturbance</b>	<b>92,787</b>	<b>116,634</b>	<b>110,092</b>	<b>110,431</b>

Under Alternative D, there would be approximately 44,300 acres of initial, short-term surface disturbance on land with federal and non-federal minerals caused by projected new wells, roads, and small pipelines constructed for oil and gas production in the high development area. Approximately 200 miles of new roads that would be added to

accommodate the new well pads projected on non-federal minerals. The total miles of new roads on both federal and non-federal minerals in the high development area would be 9 percent under Alternative D and would increase the road density to just over 3 mi/mi<sup>2</sup> if all existing roads remain open (**Table 4-19**).

Table 4-19. Existing and New Roads in High Development Area

	Alternative A	Alternative B	Alternative C	Alternative D
New Roads on Federal Minerals (miles)	358	1075	797	805
New Roads on Non-Federal Minerals (miles)	202	202	202	202
Existing Roads (miles)	10,083	10,083	10,083	10,083
<b>Total Road Miles</b>	<b>10,643</b>	<b>11,360</b>	<b>11,082</b>	<b>11,090</b>
New Roads as % of All Roads	5%	11%	9%	9%
New Road Density (miles/mile <sup>2</sup> )	2.93	3.13	3.05	3.06

Under Alternative A, there would be a total of 21,800 acres of initial, short-term surface disturbance on federal and non-federal wells, roads, and pipelines in the high development area. The total miles of new roads on both federal and non-federal minerals in the high development area would be 5 percent and would increase the road density to 2.9 mi/mi<sup>2</sup> if all existing roads remain open.

Under Alternative B, there would be a total of 49,800 acres of initial, short-term surface disturbance. The total miles of new roads on both federal and non-federal minerals in the high development area would be 11 percent and would increase the road density to over 3.1 mi/mi<sup>2</sup> if all existing roads remain open.

Initial short-term surface disturbance under Alternative C (39,300 acres) would be slightly less than under Alternative D in the high development area, but the amount of new roads and the road density would be almost the same.

Other surface disturbance would be expected to occur in the vicinity of urban areas, as municipalities increase in population. As existing coal mines expand, there would be surface disturbance that would be offset by reclamation unless new mines are opened in addition to the current mining operations. Because the coal mining industry is volatile and subject to market conditions, it is impossible to predict the location and amount of coal mining that would occur in the San Juan Basin over the next 20 years.

### **Geology and Minerals**

Hydrocarbon reserves would continue to be depleted from the formations in the basin under all alternatives and the loss of this resource is permanent. Recent gas production has been dominated by the Fruitland Coal formation. Its production trend is still increasing, and a stable trend has not yet been established. The three major conventional gas-producing formations, the Mesaverde, Dakota, and Pictured Cliffs, appear to have entered the late depletion stage (Engler et al. 2001).

Impacts on salable minerals would continue to occur and would most likely increase as construction of roads and buildings increase to meet the demands of a growing population. Sand and gravel quarries would be likely to be developed or expanded near the tri-cities area and other population centers, such as Cuba, Gallup, and Grants. There is no foreseeable demand for extracting locatable minerals during the next 20 years.

### **Soils**

The cumulative impacts on soils in the San Juan Basin would comprise the total amount of short-term and long-term surface disturbance due to all new oil and gas development and other activities. Reclamation of P&A wells and closure of roads and pipelines would reduce the overall impacts by grading and stabilizing those areas so they are no longer contributing to erosion and sedimentation. Many additional construction activities are anticipated to occur

over the next 20 years, especially in the vicinity of expanding urban areas.

It is not possible to predict the quantity of soil erosion and compaction that would result from OHVs and other surface disturbing activities in the San Juan Basin because enforcement of regulations would be a critical factor to control the amount and effect of this type of public activity on federal land. OHV access on private and state land varies across the San Juan Basin. It is known, however, that OHV traffic contributes to accelerated erosion and sedimentation, and that fewer limitations on cross-country travel would be expected on most non-federal land. It is likely that, if limitations on OHV travel are implemented on public land as proposed under Alternative D, there may be an increase in the use of OHVs across the landscape on non-federal land. This could result in moving the problem from public to non-public land, and could continue to contribute to soil erosion.

### **Water Resources**

The primary cumulative impacts on water quality would result from an increase in the amount of surface disturbance due to increased oil and gas development activity and other earthmoving activities associated with urban expansion in the planning area. This surface disturbance and increased sediment yields, along with an increase in roads that would direct sedimentation to stream crossings, would occur mainly in the high development area. Other vegetation damaging practices, such as OHV use cross-country and in drainageways, overgrazing, and vegetation management on non-public land, could contribute to increased sedimentation.

Water needed for well drilling on non-federal minerals would be approximately 1,800 acre-feet, using the same assumptions (5600 barrels/well) as described under each alternative. The total quantity of water needed to drill wells on federal and non-federal minerals over the 20-year planning period would be almost 9,000 acre-feet under Alternative D, almost 5,000 acre-feet under

Alternative A, over 11,300 acre-feet under Alternative B, and 8,900 acre-feet under Alternative C.

As population increases in the planning area, domestic water consumption would also increase, but no data are available to quantify the amount.

### **Air Quality**

The near-field impacts described under Alternative B above, considered the effects of both project actions and existing emission sources within the planning area. The far-field impact assessment discussed under Alternative B qualitatively evaluated the impacts to PSD Class I areas near the planning area. Some impacts to PSD Class I areas and to locations near concentrations of compressors have been identified. When gas wells on non-federal minerals are considered, the cumulative impacts would have the potential to be even greater.

### **Upland Vegetation**

Land disturbance and removal of vegetation would occur during oil and gas development on land with non-federal minerals, in addition to the acreage affected by federal minerals development described above. It is assumed that, on land with non-federal minerals, there would be an increase of 25 percent of the development projected for federal minerals under each alternative. The cumulative impacts on upland vegetation would equal the current disturbance (83,500 acres) plus the projected short-term surface disturbance on land with federal and non-federal minerals. In most cases, the native vegetation would not recover during the 20-year planning period, even if some areas were revegetated, so the total acreage of affected vegetation would be calculated by adding the initially disturbed acreage to the acreage of existing surface disturbance.

Following the above procedure, it is estimated that the cumulative impacts on native vegetation on all land affected by oil and gas development would total approximately

128,000 acres or 5.5 percent of the high development area under Alternative D. The range of cumulative impacts would be 105,000 acres (5.7 percent of the high development area) under Alternative A to 133,000 acres (5.7 percent of the high development area) under Alternative B. The piñon-juniper woodlands and Great Basin Desert Scrub would be the major plant communities most affected by impacts from oil and gas development.

Proposed changes in the locations of permitted cross-country OHV travel may cause impacts on vegetation to be moved from federal to non-federal land, if Alternative D were implemented. The overall impacts on vegetation in the San Juan Basin may be the same under all alternatives, but the effects would occur in different locations, depending on the alternative.

### **Riparian Areas and Wetlands**

Specific protection of riparian areas and wetlands proposed in the San Juan Basin would occur on federally managed land. The designated Riparian Areas that would limit surface disturbing activities, such as oil and gas development, OHV cross-country travel, and grazing, are under the management of the FFO. Restrictions on construction in waterways and wetlands would be required on all land in the San Juan Basin to meet the requirements of the Clean Water Act and its associated permits (404/401) but the actual impacts on non-federal land cannot be predicted. It is possible that some riparian vegetation on non-federal land in the planning area would be damaged by OHV traffic, grazing, and oil and gas development, but the extent and location of these impacts cannot be determined. The acquisition of inholdings within the expanded Riparian Areas in the FFO would mitigate some of this damage by bringing additional land under federal management with a goal of protecting important riparian and wetland resources.

As urban development and oil and gas development increases over the 20-year planning period, it is anticipated that there

would be impacts to riparian areas and wetlands from erosion, sedimentation, and damage to vegetation in addition to those impacts described for federal land. However, the location and amount of these impacts and their direct effects on riparian areas and wetlands cannot be specified.

### **Special Status Species**

It is possible that federally listed species or designated critical habitats could be affected by surface disturbance on land without federal minerals because the established special management, monitoring, and survey protocols of the federal agencies would not necessarily be required. There may be locations where federal- and state-listed species or their habitats could occur that would not be subject to the limitations on OHV use, oil and gas development constraints, or prohibitions on destruction and alteration.

It is likely that there would be some adverse effects especially to the non-federally listed special status species, including two species of plants, the gray vireo, loggerhead shrike, and various species of bats, on the 63 percent of the land in the San Juan Basin that is not federally owned or does not contain federal minerals. There is less protection of sensitive species required on privately owned land, which would result in a greater potential for negative impacts to habitat. Due to the strict requirements for threatened and endangered species protection when federal actions are conducted (described under the alternatives sections), it is anticipated that the impacts on federal land and minerals, when combined with actions such as oil and gas development on non-federal land and minerals, would not result in additional negative impacts to special status species.

### **Fisheries and Wildlife**

Wildlife inhabiting the piñon-juniper woodlands and Great Basin Desert Scrub would be the most affected by cumulative impacts. The existing surface disturbance from oil and gas operations plus projected disturbance described under each alternative, in combination with additional disturbance on

non-federal minerals, would result in increased direct loss of habitat, habitat fragmentation, and functional habitat loss. The development of new wells on non-federal land would affect wildlife such as mule deer, elk, and antelope through the building of more roads and increased human activity. These increase in road density in the high development area, when considering the existing roads and the new roads projected on land with federal and non-federal minerals (Table 4-19), would be likely to increase the functional habitat loss for many species of wildlife. The greatest such loss would occur under Alternative B, with slightly fewer impacts under Alternative D due to slightly lower predicted road density by the end of the 20-year planning period. The effects of loss of habitat on non-federal land adjacent to federal land would be most pronounced for species with large home ranges that overlap both federal and non-federal land (mule deer, elk, antelope).

Negative impacts on wildlife from OHV cross-country travel would occur where permitted throughout the San Juan Basin and would be compounded if all BLM land were to remain open to OHV access as it is currently managed (Alternative A).

### **Wilderness**

Cumulative impacts from other foreseeable development (mostly of fluid minerals and coal) on non-federal lands could indirectly affect the periphery of Bisti/De-na-zin WA and Ah-shi-sle-pah WSA through visual changes, noise, dust, and additional vehicular activity in surrounding areas. Both these protected areas overlap with coal resources. Over the next 20 years, some mines will be depleted and closed and new mines could come into production. New rail infrastructure could be part of future coal development. Railroad ROWs would likely involve a variety of federal, state and private land and would therefore be subject to NEPA review. Possible designation of Cabezón WSA as a WA would expand wilderness resources regionally.

### **Rangeland**

Much of the land in the San Juan Basin is considered to be suitable for livestock grazing. Although oil and gas development on land with non-federal minerals could add another 25 percent to the amount of surface disturbance predicted for land with federal minerals under each alternative, it would only affect about 1.6 percent of the San Juan Basin. Added to other surface disturbance from urban development and other construction, the overall effect of removing rangeland acreage from production would still be minimal when compared to the acreage of available forage. The impacts would be concentrated in the high development area and would be most significant for ranchers who graze livestock where the highest density of oil and gas development exists.

Other forage damaging activities such as OHV traffic and grazing on USBR and USFS land would continue to be controlled by agency policies. The USFS strictly controls OHV access and manages rangeland by controlling livestock AUMs. Private landowner controls on OHV access, weed management, and rangeland health are variable, so the future impacts on rangeland caused by foreseeable actions in the San Juan Basin are unpredictable. Conflicts between livestock grazers and other land users will continue to occur throughout the planning area.

### **Lands and Access**

The cumulative impacts of actions to acquire and dispose of federal lands should generally favor community development and protect valuable resources. BLM would remain open to suitable proposals under the R&PP Act under any alternative. The development of oil and gas resources in the region is a key component of the economy. Higher levels of new development in the vicinity of urban areas could bring conflicts with residential, community, and some commercial uses, mostly from potential noise sources. These conflicts would likely be most prevalent under Alternative B. Local zoning plans and regulations would provide the basis for

controlling incompatible land uses in these areas and should be developed accordingly.

Coordinating and consolidating the use of utility corridors for a variety of users and infrastructure would reduce the potential for a proliferation of bisected land holdings. By concentrating these linear uses, it would preserve flexibility for larger blocks of land for future uses. Under Alternatives C and D, the Western Region Corridor Plan would be adopted and would support better coordination of regional infrastructure and use of common corridors. Approximately 140 miles of additional corridors in the planning area proposed by Public Service Company of New Mexico (PNM) in their 20-year plan could contribute to fragmentation of land holdings, and bisect land use patterns. This trend could be reduced by coordinating corridor siting among all users.

Growth in the region is expected to increase traffic on most roadways. Ongoing and future state and federal highway projects are expected to address major transportation needs. Local effects from production on federal land on US 550, US 64, and US 173 may be considerable.

### **Visual Resources**

On a regional basis, modifications in the landscape will continue as oil and gas resources are developed. Potential for future development on non-federal land will also contribute to visual modification. Within the planning area, standards for mitigating visual impacts are only applied on federal land. It is therefore expected that human modifications will become increasingly noticeable in the landscape. Cumulative impacts on visual resources would be greatest under Alternative B, in which oil and gas development on federal land would represent the largest portion of new development, and cross-county OHV use would continue to affect wide areas. New coal mines in the Four Corners region would also potentially have significant local impacts on sensitive landscapes. Linear features such as new railroad for coal development, oil and gas field roads and pipelines, and other major

utility corridors, such as PNM's proposed corridors, could be noticeable manmade features that slowly change the landscape from predominantly natural to more evidently modified. Consolidating major infrastructure into a few corridors would minimize potential changes on a widespread basis. This could be accomplished through regional planning and coordination.

### **Cultural Resources**

The acreage of initial, short-term surface disturbance on land with federal and non-federal minerals, described under the cumulative impacts in Watersheds above, would vary between alternatives. The greatest potential for impacts to archaeological sites and TCPs would occur under Alternative B because the most wells, roads, and pipelines, disturbing 49,800 acres, would be constructed on federal and non-federal minerals. Alternative D would have slightly less disturbance, 44,300 acres, and therefore slightly less potential for impacts to cultural resources.

An additional 200 miles of new roads on non-federal minerals, added to existing roads and those projected to access federal minerals would affect a greater amount of cultural resources through direct damage and could result in increased vandalism, when considering all oil and gas activities, in combination with surface disturbance and road construction from other possible urban development in the San Juan Basin. There are more recorded sites on federal land than on land under other ownership, and fewer requirements for documenting or avoiding cultural resources on private land, so the surface disturbance caused by all development would result in a greater potential for damage to cultural resources where they are not protected by the enforcement of regulations.

### **Paleontology**

More surface and subsurface disturbance would affect a greater amount of paleontological resources when considering the amount of oil and gas activities on federal minerals, in combination with development on



land with non-federal minerals, and disturbance from other construction activities in the San Juan Basin. Excavation, drilling, and OHV traffic that would occur on non-federal land would result in a greater potential for damage to paleontological resources because they are not as well protected by the enforcement of regulations.

### **Recreation**

Cumulative impacts are most likely to occur on dispersed recreation throughout the region. Management of specially designated areas would generally preserve some of the most favored public recreation areas. Under Alternatives C and D, widespread oil and gas development would add to the level of modification (primarily visual and sound) in the environment that detracts from high quality dispersed recreation. However, expansion of recreation areas would provide some offsetting protection for locations that have the greatest appeal for recreation. Limitations on cross-country OHV use may increase cross-country OHV use on private land. Alternative B would have the greatest potential for cumulative impacts on recreation from high levels of oil, gas, and possibly coal development, and relatively little expansion of specially delineated recreation areas. Under Alternative A, loud and damaging use of OHVs over widespread areas would continue and increase throughout the planning area, as population and popularity of motorized sports increases. Although modifications from oil and gas development (to visual and sound qualities) would be somewhat less than under Alternative A, there would be no expansion of areas protected or facilities provided to meet growing demands for recreational purposes. Overall, Alternatives C and D provide the greatest balance in managing for recreational resources in the planning area.

### **Noise**

Due to the relatively small areas and localized impacts of implementing the Noise Policy, most of the planning area would be exposed to increased noise from oil and gas

activities under all alternatives, although they would be less under Alternatives C and D. This exposure would increase in areas of non-federal minerals where oil and gas development occurs, as well as on federal lands not within designated NSAs.

### **Social and Economic Conditions**

Cumulative economic impacts would arise, primarily from additional oil and gas development on federal and non-federal land in the planning area. Annual oil and gas production could more than double over current levels under Alternatives B, C, and D, and increase by about one-third for Alternative A. Coal production in the Four Corners area is not expected to increase significantly over the next 20 years (Hill and Associates 2000), and employment levels are likely to remain at current levels. Oil and gas facilities may displace some grazing, scattered widely over the planning area. This may account for relatively minor reductions in permitted grazing levels, which would have insignificant cumulative impacts.

There would be additional economic benefits in the form of jobs, expenditures, and public revenues from oil and gas development of non-federal minerals. Additional new non-federal development is estimated to generate about 560 additional jobs annually at the end of 20 years. In the local tri-cities area, new oil and gas industry jobs (both federal and non-federal mineral) generated under Alternatives B, C, and D could represent increases of about 2 to 4 percent over current employment levels and have a minor beneficial effect on the local economy, with federal development accounting for about one-half to three-quarters of this benefit. Regionally, job increases (and earnings) or losses (Alternative D only) would range from 1 to 2 percent of current levels and would be insignificant in the long-range timeframe.

An estimated \$2 billion in direct and indirect expenditures would produce an average annual expenditure of \$98,600,000. This would increase expenditures expected under Alternative A by 50 percent, and would

represent about a 20 percent increase annually over Alternative B and 25 percent over Alternatives C and D.

Taxes and royalties could increase in proportion to annual production (see above). A progressive increase over the long-term is expected under all alternatives, with the least gain under Alternative A. Benefits to the state, local jurisdictions, and school districts could result, assuming value of the product does not decline.

Overall, the effect of oil and gas development on land with non-federal minerals over 20 years would benefit economic activity in the planning area. These are expected to far outweigh any changes in jobs, expenditures, or revenues resulting from any other actions expected or likely in the region.

### **Environmental Justice**

In a region where lower paying jobs in retail and service industries have been increasing at a faster rate than others, and where employment fluctuates in bust and boom cycles of the

energy industry, continued development of energy resources represents a desirable economic engine, even if it remains subject to cycles. Because these resources are concentrated in Rio Arriba and San Juan counties that both have disproportionately minority population, benefits from growth in resource development both of federal and non-federal interests would provide jobs and therefore benefit these groups. The greatest economic benefit may occur under Alternative B, however, this level of development also has the greatest potential for increasing the level of conflict between extractive operations and other land uses, such as residential, throughout the planning area. These incompatibilities could occur widely and affect residents in the planning area, including low-income and minority groups. Development on non-federal land would need to comply with requirements of local jurisdictions or tribes. Where local controls are minimal, there would be increasing possibility for incompatible development.

## CHAPTER 5

### CONSULTATION AND COORDINATION

#### INTRODUCTION

During the planning process for this Draft RMP/EIS, formal and informal efforts were made by the BLM to involve other federal agencies, state, local, and tribal governments, and the public. BLM initiated the planning process in September 2000 by requesting comments to determine the scope of the issues and the concerns that should be incorporated into the action alternatives and impact analysis. A Core Team of BLM, USBR, and USFS staff formed the interdisciplinary team that guided the identification of the issues and the development of the RMP/EIS project description and alternatives.

As part of the data collection and resource inventory process, FFO staff and consultants formally and informally contacted agencies to request information to supplement that provided by the BLM. This included information on fish and wildlife, special status species, and site and survey data from the NM ARMS database.

This chapter describes the formal consultation with agencies and tribes, the public participation activities and results, and the consistency of this document with other plans in the region. It also lists the next steps in the process, the agencies and organizations that received copies of the Draft RMP/EIS for review, and lists the individuals who prepared and reviewed the document.

#### FORMAL CONSULTATION

Consultation with the USFWS is required under Section 7 of the ESA of 1973 prior to initiation of any project by BLM that may affect

any federally listed threatened or endangered species or its habitat. This RMP/EIS is considered to be a major project and formal consultation has been initiated. Letters of formal consultation and notes from meetings of BLM, consultants, and USFWS biologists are on file. A Draft BA that evaluates the impacts of the proposed action on federal threatened and endangered species will be submitted to the USFWS to obtain a biological opinion.

This plan is also consistent with legislation protecting state listed species. BLM and consulting biologists have contacted NMDGF staff, who will review the Draft RMP/EIS. Consultation with the state and federal agencies will continue throughout the RMP process and implementation of the plan.

The BLM cultural resource management program operates in accordance with 36 CFR Part 800, which provides specific procedures for consultation between the BLM and the SHPO. The SHPO has been consulted during the development of the Draft RMP/EIS concerning cultural resources that may be affected. A copy of the Draft RMP/EIS has been sent to the SHPO for review and comment.

In accordance with the NHPA, letters were sent to 51 different tribal governments and 29 other tribal officials in March and May 2001 to inform them of the project. The letters also requested their input on issues and concerns that should be considered during the planning process and initiated efforts to identify and consider traditional cultural places. The recipients of these letters are listed in **Table 5-1**.

Table 5-1. Recipients of Tribal Consultation Letters

Tribe	Presiding Officer	Other Recipients
Hopi Tribal Council	Wayne Taylor, Jr., Chairman	Leigh Kuwanwisiwma, Director, Cultural Preservation Office
Jicarilla Apache	Claudia J. Vigil-Muniz, President	Melton Sandoval, Cultural Preservation Officer
Pueblo of Acoma	Cyrus J. Chino, Governor	Brian Vallo, NAGPRA Officer
Pueblo of Cochiti	Regis Pecos, Governor	
Pueblo of Isleta	Alvino Lucero, Governor	Lawrence Lucero, Lieutenant Governor
Pueblo of Jemez	Joe Cajero, Governor	Bill Whatley, Cultural Preservation Officer
Pueblo of Laguna	Henry D. Early, Governor	Victor Sarracino, NAGPRA Officer
Pueblo of Nambe	David A. Perez, Governor	Denise Perez, Secretary-Treasurer; Councilman Ernest Mirabel, NAGPRA Representative
Pueblo of Picuris	Charles Chile, Governor	Joe Quanchello, Cacique; Richard Mermejo, Lieutenant Governor
Pueblo of Pojoaque	Jacob Viarrial, Governor	Marcia Martinez, Governor's Secretary; Charlie Tapia, War Chief
Pueblo of San Felipe	Lawrence Trancosa, Governor	Bruce Garcia, Tribal Administrator
Pueblo of San Ildefonso	Perry Martinez, Governor	Myron Gonzales, Cultural Preservation Officer
Pueblo of San Juan	Wilfred Garcia, Governor	Herman Agoyo, Realty Officer
Pueblo of Sandia	Stewart Paisano, Governor	Jenny Holmes, Historic Preservation Office
Pueblo of Santa Ana	Bruce Sanchez, Governor	
Pueblo of Santa Clara	Denny Gutierrez, Governor	Alvin Warren, Rights Protection Officer
Pueblo of Santo Domingo	Ramon Garcia, Governor	
Pueblo of Taos	Nelson Cordova, Governor	Isidro Mirabel, War Chief
Pueblo of Tesuque	Charlie Dorame, Governor	Gary Moquini, Director, Parks and Wildlife
Pueblo of Zia	William Toribio, Governor	Celestino Gachupin, Natural Resource Department
Pueblo of Zuni	Malcolm Bowekaty, Governor	Jonathan Damp, Heritage and Historic Preservation Office
Southern Ute Tribe	Leonard C. Burch, Chairman	Michael Olguin, Natural Resource Director; Everett Burch, Cultural Preservation Division Director
The Navajo Nation	Kelsey A. Begaye, President	Dr. Alan Downer, Director, Historic Preservation Department
Ute Mountain Ute Tribe	Ernest House, Chairperson	Terry Knight, Tribal Culture Representative

Navajo Chapters	Recipient
Baca Chapter	Rosita Loretto, Coordinator
Becenti Chapter	Juliette Largo, Coordinator
Casamero Lake Chapter	Sharon Wellito, Coordinator
Church Rock Chapter	Leonard Francisco, Jr., Coordinator
Hogback Chapter	Sara H. Sandoval, Coordinator
Iyanbito Chapter	Jerry L. Frank, Coordinator
Lake Valley Chapter	Etta P. Tso, Coordinator
Little Water Chapter	Tim C. Morgan, Coordinator
Mariano Lake Chapter	Raquel Warber, Coordinator
Nahodishgish Chapter	Eddie F. Morgan, Coordinator
Nenahnezad Chapter	Clarence Hogue, Jr., Coordinator
Ojo Encino Chapter	Elizabeth Stoney, Coordinator
Pinedale Chapter	Louise M. Mariano, Coordinator
Pueblo Pintado Chapter	Sammie Jim, Coordinator
Rock Springs Chapter	Harriett K. Becenti, Coordinator
San Juan Chapter	Rita Slim, Coordinator
Shiprock Chapter	Marilyn Garcia, Coordinator
Smith Lake Chapter	Jackson Gibson, Coordinator
Standing Rock Chapter	Ray C. Billy, Coordinator
Thoreau Chapter	Julia Martinez, Coordinator
To'Ha'ji'lee Chapter	Glen Begay, Coordinator
Torreón Chapter	Wally Toledo, Coordinator
Tsayatoh Chapter	Charles Morrison, Coordinator
Twin Lakes Chapter	Dorothy Denetclaw, Coordinator
Upper Fruitland Chapter	Jimmy Blueeyes, Coordinator
Whitehorse Lake Chapter	Bobby Tsosie, Coordinator
Whiterock Chapter	Robert Martin, Coordinator

## CONSISTENCY WITH OTHER PLANS

The BLM planning regulations require that RMPs be “consistent with officially approved or adopted resource-related plans, and the policies and procedures contained therein, of other federal agencies, state and local governments, and Indian tribes, so long as the guidance and RMPs are also consistent with the purposes, policies and programs of federal laws and regulations applicable to public lands...” (43 CFR 1610.3-2). In order to ensure such consistency, finalized plans were solicited from

federal, state, and local agencies and groups, as well as from tribal governments. These same agencies will receive copies of this document and will be asked to submit comments.

There are no known inconsistencies between any of the alternatives and other officially approved and adopted resource-related plans of other federal agencies, state and local governments, and Indian tribes. Coordination and consultation will take place during the public comment period on the Draft

RMP/EIS, Proposed RMP/Final EIS, and the Record of Decision.

## **PUBLIC PARTICIPATION**

The planning issues were developed partly by considering the concerns and comments from people outside the BLM and the cooperating agencies. Comments were received both in formal public scoping meetings and in public interviews conducted for the BLM in the local communities. The comments identified by FFO staff to be related to the RMP process are summarized in the following sections and were used to assist in the development of the alternatives analyzed in the Draft RMP/EIS. The comments determined to be unrelated to the RMP process that could be addressed by FFO staff immediately were directed to the appropriate resource specialist for action.

### **Public Scoping**

Formal public scoping meetings were held in the tri-cities area from September 26 to October 8, 2000. Comments were documented and later grouped into categories in a report created by the FFO (BLM 2001b). The three general categories of comments were: 1) OHV use and general recreational use of the FFO area, 2) commercial development within the FFO area, and 3) comments on the RMP process.

The first category comprised the most public comments at the meetings, with 439 respondents. Most of the comments can be subdivided into those people interested in opening the FFO area to increased OHV use and those who prefer to limit OHV access. Several areas and trails were specifically identified to be set aside for use only by non-motorized recreationists, such as hikers, bicyclists, or horses. Other areas and trails were recommended to be designated for or maintained as open to OHV use. Additional comments included recommendations to designate accessible shooting areas, to prohibit the use of firearms where public safety may be compromised, to develop environmental education areas, and to organize meetings with

FFO staff to discuss the concerns of special user groups.

In the second category, comments from five respondents addressed the commercial use of public land and minerals, mostly related to the development of mineral leases including coal leases, the conflicts between coal mining and oil and gas development, concerns over the constraints on the development of oil and gas, and concerns over transferring federal surface ownership without protection of the development rights for mineral lessees (split estate). One comment recommended the development of commercial production of Navajo tea.

The last category contained comments submitted by one respondent and included recommendations for what should be included in the RMP revision. It was stressed that the RMP must comply with federal laws and should employ a collaborative process.

In addition to participating in the formal public scoping meetings, FFO staff specialists met with groups interested in recreation on public lands and received recommendations on trails that should be opened and developed for a variety of activities. While some of these recommended trails appear in the proposed alternatives, others will be reviewed by staff and possibly designated in the future through the development of activity plans, a process that provides opportunities for public involvement and would require an amendment of the RMP.

Other FFO staff met with municipal officials to request that they identify parcels of land that the municipalities (county, city, school boards) might be interested in acquiring from the BLM through land transfers.

### **Public Interviews**

Public interviews were conducted in the local communities from December 2000 to April 2001. Interviewers made a point of engaging a variety of people in conversation by frequenting community-gathering places, such as restaurants, laundromats, churches, and stores. The groups of people interviewed included residents, local government officials,

local and out-of-town recreationists, oil and gas company employees, merchants, and others. In general, the interviews sought descriptions about settlement patterns, work routines, recreation activities, support services, geographic features of importance, changes on the land and in the communities, the use of public land, and ideas for improving BLM land management (Preister 2001).

Many of the comments from these interviews are important to the BLM but were determined by FFO staff to be unrelated to the development of the Draft RMP/EIS. The comments provided but not applied during development of the RMP will be considered by the BLM to help them serve the public, but were not documented in this Draft RMP/EIS or carried into the alternatives. The report that summarizes the interview methodology and lists all of the comments in detail is an unpublished document that can be obtained from the FFO (Preister 2001).

Many of the comments that were considered to be relevant to the development of the Draft RMP/EIS alternatives highlight the potential conflicts between the multiple uses of federal land. The major categories of these comments from the interviews can be grouped into the following categories: 1) oil and gas development, 2) recreation, and 3) community interests and urban development pressures.

Issues raised about oil and gas development include the following:

- Noise generated from oil and gas sites and its impact on recreational and residential land uses was the single most common complaint voiced in the interviews.
- Concerns over the high road density and its effects on watersheds, wildlife, and recreation.
- The use of roads developed by oil and gas companies for increased access by OHVs as a recreation issue, and damage caused to watersheds, wildlife, forestry, cultural and paleontological sites, and rangeland.
- Concerns over inadequate well and pipeline site reclamation causing the spread of weeds and excessive surface disturbance that affect watershed management, wildlife, and grazing land.
- Protection of cultural sites from pot-hunting and other surface disturbances once access is increased and the sites are identified for avoidance and protection.
- Concerns for watershed protection due to the lack of clean-up of spills in areas on or near well sites and the dumping of waste and household trash, partly because remote areas are opened to public access as more roads are constructed.
- Establishment of adequate fencing for livestock to prevent their access to well sites.

As in the public scoping meetings, recreation issues that were raised in the interviews documented the conflicts between different types of users, especially among OHV recreationists, non-motorized vehicle users, horseback riders, and hikers, and the need to designate specific areas for specified uses. Safety concerns were raised where firearms are used. Inadequate law enforcement was voiced as a concern because the BLM has had difficulty enforcing their limitations on use designations and compliance with existing laws and policies under various programs due to the lack of sufficient resources.

Concerns over development pressures in the tri-cities area resulted in comments that BLM land should be made available for transfer for municipal uses, but the riparian habitat should be protected for its wildlife and recreation benefits.

### **Newsletter**

A newsletter containing brief descriptions of some of the issues to be addressed in the RMP/EIS was prepared and mailed to almost 1,600 individuals, agencies, and organizations. It contained a coupon for interested people to

request a copy of the Draft RMP/EIS or to ask to remain on the mailing list. Approximately 140 people returned coupons in response.

### **Public Review of the Draft RMP/EIS**

Informal coordination with the public has taken place throughout the planning process through personal contacts, phone calls, and attendance at meetings.

Concurrent with the distribution of this Draft RMP/EIS, a BLM Notice of Availability was published in the *Federal Register* announcing the availability of the Draft RMP/EIS for public review and comment. The EPA Notice in the *Federal Register* marks the beginning of the 90-day review and comment period.

Public hearings will be held during the comment period. Hearing dates and locations will be published in the local newspapers and on the Farmington Field Office web site, [http://www.nm.blm.gov/www/ffo/ffo\\_home.html](http://www.nm.blm.gov/www/ffo/ffo_home.html).

Written and oral comments received during the 90-day period will be compiled, analyzed, and summarized. Comments will be addressed if they are substantive and relate to inadequacies or inaccuracies in the analysis or methodologies used, identify new impacts or recommend reasonable new alternatives or

mitigation measures, or involve substantive disagreements on interpretations of significance (see 40 CFR 1502.19, 1503.3, 1503.4, 1506.6, and 516 DM 4.17).

A Proposed RMP/Final EIS will be prepared that addresses the comments and provides responses to each comment received on the Draft RMP/EIS. After distribution of the Proposed RMP/Final EIS, a Governor's Consistency Review, and a 30-day public protest period, the BLM will issue a Record of Decision summarizing the findings and decisions regarding the preferred alternative and its determination regarding compliance with NEPA and other regulations. The RMP will be prepared to document the resource management decisions and complete the BLM's resource management planning process.

**Table 5-2** contains a partial list of federal, state, municipal, and tribal agencies, governments, and other interested organizations to whom copies of the Draft RMP/EIS were mailed. Private citizens and businesses, including many in the oil and gas industry, also received copies. The document will be available from the FFO upon request, so this list will grow after the Notice of Availability has been published.

**Table 5-2. List of Draft RMP/EIS Recipients**

<b>Federal Government</b>	
<b>U.S. Department of Agriculture</b>	<b>U.S. Department of Commerce</b>
Carson National Forest	National Oceanic and Atmospheric Administration
Natural Resources Conservation Service	National Weather Service
Santa Fe National Forest	
<b>U.S. Department of the Interior</b>	<b>Other</b>
Bureau of Indian Affairs	Department of Defense
Bureau of Land Management	Department of Energy
Bureau of Reclamation	Environmental Protection Agency
National Park Service	Federal Energy Regulatory Commission
U.S. Fish and Wildlife Service	U.S. Army Corps of Engineers, Civil Works
U.S. Geological Survey	



State Government	
State of New Mexico	State of Colorado
Association of Conservation Districts	Division of Water Resources
Cuba Soil and Water Conservation District	Division of Wildlife
Department of Agriculture	State Parks
Department of Finance and Administration	Water Conservation
Department of Game and Fish	Wildlife Commission
Department of Energy, Minerals, and Natural Resources	
Environment Department	State of Utah
Highway and Transportation Department	Utah Department of Natural Resources
Interstate Stream Commission	Utah Division of Wildlife
Navajo Lake State Park	University of Utah
Oil and Gas Commission	State of Wyoming
Rio Arriba County Extension Service	Wyoming State Engineer
Sandoval County Extension Service	
State Engineer	
State Game Commission	
State Land Office	
State Parks	
State Police	
University of New Mexico	
Municipal Officials	
Archuleta County Commissioners	Farmington Public Library
City of Aztec	La Plata County
City of Bloomfield	McKinley County Commissioners
City of Durango	Rio Arriba County Commissioners
City of Farmington	San Juan County
City of Gallup	San Juan County Commissioners
Cuba Chamber of Commerce	San Juan Water Commission
Cuba Economic Development Board	Sandoval County Commissioners
Special Interest Groups	
Bloomfield Irrigation Ditch Association	San Juan College
Hammond Conservancy District	San Juan River Dineh Water Users
Lower Valley Water Users	Southwestern Water Conservation
Navajo Agricultural Products, Inc.	Upper Colorado River Commission
Navajo Dam Water Users	

Tribal Governments and Organizations		
All Indian Pueblo Council		Pueblo of San Ildefonso
Eight Northern Pueblos, Inc.		Pueblo of San Juan
Hopi Tribe		Pueblo of Sandia
Jicarilla Apache Tribe		Pueblo of Santa Ana
Pueblo of Acoma		Pueblo of Santa Clara
Pueblo of Cochiti		Pueblo of Santo Domingo
Pueblo of Isleta		Pueblo of Taos
Pueblo of Jemez		Pueblo of Tesuque
Pueblo of Laguna		Pueblo of Zia
Pueblo of Nambe		Southern Ute Indian Tribe
Pueblo of Picuris		The Navajo Nation
Pueblo of Pojoaque		Ute Mountain Ute Tribe
Pueblo of San Felipe		
Navajo Chapters		
Baca Chapter	Nahodishgish Chapter	Standing Rock Chapter
Becenti Chapter	Nenahnezad Chapter	Thoreau Chapter
Casamero Lake Chapter	Ojo Encino Chapter	To'Ha'ji'lee Chapter
Church Rock Chapter	Pinedale Chapter	Torreón Chapter
Hogback Chapter	Pueblo Pintado Chapter	Tsayatoh Chapter
Iyanbito Chapter	Rock Springs Chapter	Twin Lakes Chapter
Lake Valley Chapter	San Juan Chapter	Upper Fruitland Chapter
Little Water Chapter	Shiprock Chapter	Whitehorse Lake Chapter
Mariano Lake Chapter	Smith Lake Chapter	Whiterock Chapter

**Table 5-3** and **Table 5-4** list the consultants and BLM staff that were directly involved with the preparation of the Draft

RMP/EIS. **Table 5-5** lists the BLM and other government staff who reviewed portions of this document.

**Table 5-3. List of Preparers—Consultants**

Name	Responsibility	Education	Experience
Neal Ackerly (Dos Rios Consultants, Inc.)	Cultural Resources	Ph.D., Anthropology, Arizona State University, Tempe M.A., Anthropology, University of Arizona, Tucson B.A., International Relations, Florida State University, Tallahassee	28 years, Vice President, Dos Rios Consultants, Inc., Senior Archaeologist

Name	Responsibility	Education	Experience
Kate Bartz	Water Resources	M.S., Landscape Architecture and Environmental Planning, Utah State University B.S., Environmental Studies, Utah State University	15 years, Environmental Specialist
Robin M. Brandin, A.I.C.P.	Project Manager, Quality Control	M.R.C.P., City and Regional Planning, Rutgers University B.A., History of Art, Bryn Mawr College	26 years, Senior Program Manager
Charles Burt	Biological Resources	M.S., Forest Zoology, SUNY B.S., Biology, Hope College	27 years, Senior Biologist
Bonnie Carson	Oil and Gas, Geology	M.S., Environmental Science and Engineering, Colorado School of Mines B.S., Geology and Geophysics, Missouri School of Mine B.S., Applied Mathematics and Computer Sciences, Washington University	14 years, Senior Project Engineer
Rob Cavallaro	Fisheries	B.S., Forestry and Wildlife, Virginia Polytechnic Institute and State University	12 years, Wildlife Ecologist
Jonathan Cohen	Document Production	B.A., Communication Arts, University of Wisconsin, Madison	7 years, Word Processor
Chris Crabtree	Air Quality	B.A., Environmental Studies, University of California, Santa Barbara	16 years, Senior Air Quality Meteorologist
David Dean	GIS	B.S., Biology, University of Wisconsin, La Crosse	2 years, Environmental Scientist
Ellen Dietrich	Deputy Project Manager, Soils, Rangeland, Noise, Coal	B.A., Anthropology, University of Illinois	26 years, Senior Natural Resources Specialist
Susan Goodan	Land Use, Recreation, Wilderness, Socioeconomics, Environmental Justice	M. Architecture, University of New Mexico B.A. Philosophy/ Archaeology, University of Cape Town, South Africa	14 years, Senior Environmental Planner

Name	Responsibility	Education	Experience
Heather Gordon	GIS	B.A., Environmental Studies and Planning, California State University, Sonoma B.A., Liberal Studies, California State University, Sonoma	5 years, GIS Specialist
Ken Heil	Vegetation, Weeds	M.S., Botany, Washington State University B.S., Biology, Fort Lewis College	18 years, Professor of Geology and Biology, San Juan College
Jon Marin	Coal	M.S., Geology, South Dakota School of Mines and Technology B.S., Earth Science, University of South Dakota	19 Years, Senior Geologist
Richard McEldowney	Biological Resources	M.S., Rangeland Ecosystem Science, Colorado State University, 1999 B.S., Wildlife Biology, University of Montana, 1993	6 Years, Wetlands Scientist

Table 5-4. List of Preparers—Bureau of Land Management

Name	Responsibility	Education	Experience
Elizabeth C. Allison	Technical Coordinator	B.S., New Mexico State University	BLM: 28 years, Planning and Environmental Coordinator/ Environmental Specialist
Charlie Beecham, P.E.	Solid Minerals (Coal)	B.S., Colorado School of Mines	BLM: 17 years, Mining Engineer Branch Chief, Solid Minerals Industry; 5 Years, Mining/Oil and Gas.
Kelly Castillo	Fire/Forestry	B.S., Northern Arizona University	BLM: 4 years, Fire Management USFS: 8 years, Fire Management
James M. Copeland	Cultural Resources	M.A., Colorado State University	BLM: 11 years, Lead Archaeologist Navajo Nation: 5.5 years, Archaeologist NPS: 2 years, Archaeologist BIA: 1.5 years, Archaeologist Private Contracting: 5 years

Name	Responsibility	Education	Experience
Peggy Gaudy	Cultural Resources	M.A., Northern Arizona University B.S., Northern Arizona University	BLM: 23 years, Archaeologist USFS: 2 years, Archaeologist NPS: 1 year, Interpreter
John Hansen	Wildlife Management	M.S., (in progress) Entomology, University of Nebraska B.S., Idaho State University	BLM: 24 years, Wildlife Biologist, Range Conservationist NRCS: 3.5 years, Soil/Range Conservationist Idaho Fish and Game: 2 years
Steve Henke	Field Office Manager, Initial Team Leader	B.S., New Mexico State University	BLM: 25 years, Field Office Manager, Supervisory Range Conservationist, Range Conservationist
Terry Johnson	Roads	A.A.S., Bemidji Technical College	BLM: 2 years, Civil Engineer Technician USFS: 25 years, Civil Engineer Technician
Jim Lovato	Oil and Gas	B.S., New Mexico Institute of Mining and Technology	BLM: 18 years, Petroleum Engineer MMS: 2 years, Petroleum Engineering Technician
Robert Moore	Team Leader	B.S., Colorado State University	BLM: 31 years, Natural Resource Specialist
Jackie Neckels	Recreation/Wilderness	B.A., New Mexico State University	BLM: 12 years, Environmental Protection Specialist, Outdoor Recreation Planner
Bruce Prater	Noise Policy	B.S., University of Alabama	BLM: 5 years, Bureau Safety Manager Dept. of Army: 23 years, Safety Specialist
Ray Sanchez	Range Management	B.S., New Mexico State University	BLM: 20 years, Range Management USFS: 4 years, Range Management NRCS: 2 years, Range Management
Richard Simmons	Recreation/Wilderness	B.S., Utah State University	BLM: 8 years, Outdoor Recreation Planner NPS: 19 years, Resource Management, Visitor Protection/ Interpretation
Dave Simons	Cultural Resources	B.A., University of New Mexico	BLM: 17 years, Archaeologist

Name	Responsibility	Education	Experience
Bill Walsh	Bureau of Reclamation Representative	B.S., California State College	BOR: 25 years, Supervisory Resource Management Specialist, Geologist
Barney Wegener	Threatened and Endangered Species/ Riparian	B.S., Ft. Lewis College	BLM: 9 years, Natural Resource Specialist
Dale Wirth	Soil, Air, Water, Coal	B.S., Colorado State University	BLM: 13 years, Natural Resource Specialist BIA: 7 years, Soil Scientist OSM: 3 years, Project Manager
<b>Support Staff</b>			
Vera Bee	GIS		
Luanne Crow	Mailing		

Table 5-5. List of Reviewers

Farmington Field Office	Albuquerque Field Office	New Mexico State Office	Bureau of Reclamation
Mary Jo Albin Elizabeth C. Allison Charlie Beecham Kelly Castillo James M. Copeland Joel Farrell Peggy Gaudy John Hansen Steve Henke Shannon Hoefeler Terry Johnson Jim Lovato Dave Mankiewicz Ralph Mason Robert Moore Jackie Neckels Ray Sanchez Rich Simmons Dave Simons Brian Watts Barney Wegener Dale Wirth	John Bristol Kent Hamilton Pat Hester	Mark Blakeslee Bernard Chavez Stephen Fosberg Mark Hakkila Clarence Hougland James Olsen Joan Resnick Paul Sawyer John Selkirk James Silva Jay Spielman Gary Stephens Ida Viarreal John W. Whitney	Rob Waldman Bill Walsh